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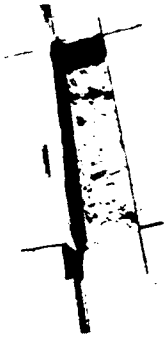

# MAINTENANCE MANAGEMENT SYSTEM

by

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19 ABSTRACT (Continue on reverse if necessary and identify by block number)

A need exists to develop a maintenance management system to manage the routine, day-to-day pavement maintenance work not included in the pavement management system (PAVER). This project involved the identification of pavement items to be included, associated maintenance work activities and planning guidelines for each identified maintenance work activity. Over 60 planning guidelines were developed and are presented in the report. Each planning guideline includes the labor, equipment and materials resources and recommended work procedures to perform the work in an effective and economical manner. Daily work accomplished is measured in work units. The work activities and planning guidelines were used to develop a routine maintenance work program and budget for one of the six army installations visited. This demonstrated the potential for further development and implementation of maintenance management systems involves the development and implementation of the complete cycle of planning, organizing, directing and controlling at two pilot test installations. The maintenance management system for routine pavement maintenance would be interfaced with PAVER and the microcomputer Intergrated Facilities System.

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# PREFACE

This report documents the development of maintenance planning guidelines for routine pavement maintenance at US Army installations. This work was sponsored by US Army Corps of Engineers, Engineering Housing Service Center (EHSC) and performed for the US Army Corps of Engineers, Waterways Experiment Station (WES), under Contract No. DACA39-87-M-0999. The EHSC Technical Monitor was Ken Gregg.

Information on existing pavement maintenance operations was obtained by the Principal Investigators conducting on-site visits and data collection at Fort Leonard Wood, Fort Bliss, Fort Devens, Fort Stewart, Rock Island Arsenal, and Sierra Army Depot. Personnel from the Office of the Chief of Engineers, Washington, DC, provided information on the work management and contracting procedures being used by the Corps of Engineers. The Tri-Service Manual, "Maintenance and Repair of Surface Areas," TM 5-624/NAVFAC MO-102/AFM 85-8, provided the basic framework for the maintenance and repair procedures of the maintenance planning guidelines. References to TM 5-624 are made throughout the planning guidelines.

Appreciation is extended to the Corps of Engineers personnel at the Army installations visited, especially, Sierra Army Depot's assistance in developing the illustrative maintenance work program. Contributions and assistance provided by other Corps of Engineer contacts are also appreciated.

The study was conducted under the general supervision of Dr. W. F. Marcuson III, Chief, Geotechnical Laboratory (GL); Messrs. H. H. Ulery, Jr., Chief, Pavements Systems Division (PSD), GL; J. W. Hall, Jr., Chief, Engineering Investigations, Testing, and Validation Group, PSD; and L. N. Godwin, Chief, Materials Research Center, PSD. This report was produced under the direct supervision of Dr. R. S. Rollings, Chief, Materials Research and Construction Technology Branch, PSD. Mr. Timothy Vollor was the WES Technical Monitor.

Commander and Director of WES during the preparation of this report was COL Larry B. Fulton, EN. Dr. Robert W. Whalin was Technical Director.

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## CONVERSION FACTORS, NON-SI TO SI (METRIC) UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI (metric) units as follows:

| Multiply | By | To Obtain |
|---|---|---|
| acre | 0.40469 | hectare |
| acre | 0.00405 | square kilometer |
| cubic feet | 0.02832 | cubic meter |
| cubic yard | 0.76464 | cubic meter |
| feet | 0.30480 | meter |
| gallon | 3.78532 | liter |
| inch | 0.02540 | meter |
| mile | 1.60934 | kilometer |
| pound | 0.45359 | kilogram |
| square feet | 0.09290 | square meter |
| square yard | 0.83613 | square meter |
| ton (U.S.) | 907.1848 | kilogram |
| ton (U.S.) | 0.90718 | metric ton |
| yard | 0.91440 | meter |

## GLOSSARY OF TERMS

Contract Maintenance

The use of private contractors to perform routine maintenance work.

Daily Production

The amount of work expressed in work units accomplished during a standard work day using the recommended work procedure, personnel, equipment and materials.

Inventory Unit of Measure

The pavement feature and unit of measure, e.g. bituminous lane mile, ditch mile.

Maintenance Item

Feature of the pavement system top be maintained, e.g. bituminous surface, unpaved shoulder, traffic sign. Also referred to as pavement item.

Maintenance Management System (MMS)

A method for planning, organizing, directing and controlling routine pavement maintenance and other operations.

Planning Guideline

The documentation for each work activity that provides the recommended work procedure and resources required to perform the work activity in an effective and economical manner.

Routine Maintenance

The minor repair, preservation and upkeep of pavement items to provide a safe, smooth and structurally sound pavement.

Work Activity

The type of maintenance work that is performed on each maintenance item or feature of the pavement; e.g., crack sealing, full-depth patch, machine mowing, plow runways.

Work Unit of Measure

The measurement unit used to plan annual work quantities and to report daily work accomplished for a work activity, e.g., tons, square yards, miles, acres.

Work Procedure

A series of work tasks required to complete a whole job with a single measurable output. Typically performed by a crew of work team.

# MAINTENANCE MANAGEMENT SYSTEM

## PART I: SUMMARY

1. The Corps of Engineers recognized the need for army installations to have a maintenance system to manage the routine, day-to-day pavement maintenance work not included in the pavement management system (PAVER). Maintenance management systems encompass the full management cycle of planning, organizing, directing and controlling.

2. The initial effort in the development of a maintenance management system for pavements involved the following three tasks:

   a. Identify pavement items or components to be maintained, such as bituminous pavement, concrete pavement, unpaved shoulders, ditches, traffic control markings and other features.

   b. Identify maintenance work activities associated with each pavement item.

   c. Develop planning guidelines for identified maintenance work activities.

The pavement items, activities and guidelines had to be adaptable to any installation of the Department of the Army. Therefore, information on pavement maintenance operations and requirements was collected at six army installations that represented different missions, climates, terrains and sizes.

3. US Army technical manuals provided the basic information. Information from implemented maintenance management systems at the national, state and local government levels was also utilized.

4. The identified pavement items, work activities and planning guidelines represent requirements on a regional or national basis, as opposed to a specific installation. The intent was to define a sufficient number to accommodate army installations throughout the United States.

5. Maintenance items. The physical features of the pavement systems requiring routine maintenance were identified and given a unit of measure for inventory purposes. Maintenance features include bituminous surface, unpaved surface, unpaved shoulders, traffic signs, ditches and other items.

6. Maintenance work activities. Sixty-four (64) work activities related to the maintenance items were also identified. Example work activities are pothole patching, crack sealing, epoxy patching, patch paved

shoulder, runway sweeping and repair signs. A work unit was selected for each activity to measure the output produced by a maintenance crew, for example, tons of material placed, square yards of surface patched, road miles graded and number of signs repaired. Work measurement was kept simple not to burden field workers with calculations and paper work.

7. Planning guidelines. A planning guideline was developed for each work activity. The guidelines contain a recommended work procedure and the labor, equipment and materials resources required to economically accomplish quality work. Typical daily crew production is also provided. The planning guidelines reflect current field maintenance practices for army pavement systems and can be easily modified for use at a specific installation where deviation from typical practice is warranted and necessary.

8. Demonstration program and budget. Planning guidelines and other information were used to develop a routine maintenance work program and budget for Sierra Army Depot, one of the six installations visited. This demonstrated the potential for further development and implementation of maintenance management for pavements at army installations.

## Findings

9. Findings address the management of routine maintenance for pavements at US Army installations.

a. An annual quantified program of routine maintenance work is not provided to the first line supervisor.

b. Current maintenance evaluation reports do not include quantities of accomplished work current reporting focuses on resources.

c. Current resource estimates for activities are "built up" from detailed tasks by craft. Frequently, these estimates have minimum value to the first-line supervisor in scheduling, mobilizing crews and performing work.

d. Reports on person-hour usage and costs do not provide the first-line supervisor information required to effectively direct and control field operations.

e. A significant portion of routine and cyclic maintenance is performed by contract. The absence of planning guidelines and annual work estimates limits the effectiveness of contracts and gives little direction for contract management.

f. There are areas where a management system for routine pavement maintenance would enhance PAVER, as well as other information support for first-line supervisors. Example areas are annual

work planning, job estimating, resource requirements and work history.

## Recommendations

10. The following recommendations are made for developing the additional components of a routine pavement maintenance management system for the US Army Corps of Engineers.

a. The complete maintenance management cycle of planning, organizing, directing and controlling be developed and implemented for the pavement systems at a minimum of two pilot test locations with emphasis on work and support of first-line supervisors.

b. Pilot test development and implementation efforts be interfaced with PAVER for inventory, annual work quantity planning and possibly routine maintenance history by pavement section.

c. Existing informational systems be utilized as data input for planning and organizing routine pavement maintenance operations.

d. Available national maintenance management system (MMS) software be utilized to develop the planning, organizing, directing and controlling components of MMS for routine pavement maintenance, as demonstrated for Sierra Army Depot for planning.

e. Planning guidelines developed for routine pavement maintenance be utilized to better estimate resource and work requirements in-house hand work requirements for contracts.

## PART II: INTRODUCTION

### Why Develop a Maintenance Management System

11. The pavement management system, entitled PAVER, identifies pavement repair and rehabilitation needs. Pavement strategies are determined at the network and project level and tend to be cyclic improvements. The Corps of Engineers developed PAVER which has been implemented successfully by several Army, Air Force and Navy installations. Additionally, PAVER has been adopted by the American Public Works Association (APWA) and implemented in various cities and counties throughout the United States.

12. The Corps of Engineers recognized the need to have a pavement maintenance management system to manage the routine, day-to-day, maintenance work activities not included in PAVER. The maintenance management system includes the full management cycle of planning, organizing, directing and controlling.

### Components of Phase One

13. As the first step in the development of a pavement maintenance management system specific components of the management system were developed during this project. These components included the following:

a. Pavement items, or features, of the pavement system to be included.

b. Maintenance work activities associated with each pavement item.

c. Planning guideline for each identified maintenance work activity.

14. The elements of the maintenance management system developed during this project provides the framework for subsequent phases of development and implementation. The pavement maintenance management system for routine maintenance work encompasses pavement maintenance not included in PAVER and provides management support for the complete scope of work performed on pavements.

## Designated Work Tasks

15. The initial effort in the development of a pavement maintenance management system involved three (3) designated work tasks. These tasks were:

a. Identify pavement items of the pavement systems to be included. These are the pavement components to be maintained, such as bituminous pavement, concrete pavement, unpaved shoulders, ditches, traffic control markings and other features.

b. Identify maintenance work activities associated with each pavement item.

c. Develop planning guidelines for identified maintenance work activities.

16. Maintenance and repair techniques in the Tri-Service Manual, Maintenance and Repair of Surface Areas, TM 5-624/NAVFAC MO-102/AFM 85-8 were designated to be followed in the development of pavement maintenance planning guidelines. This manual provides guidance for the maintenance and repair of roads, streets, parking areas, airfields, walks and other pavement areas at the Army, Air Force and Navy installations.

## US Army Installations Visited

17. Since the maintenance management system was to be adaptable to any of the Department of Army installations in the United States, information on pavement maintenance operations and requirements was to be collected at army installations that represented different missions, climates, terrains and sizes.

18. Two (2) installations were selected from each of the three major commands responsible for the majority of the pavement surfaces at army installations. The following installations were selected for on-site visitation and in-depth data collection on pavement maintenance operations:

a. FORSCOM - Forces Command
Fort Devens, Massachusetts
Fort Stewart, Georgia

b. TRADOC - Training and Doctrine Command
Fort Bliss, Texas
Fort Leonard Wood, Missouri

c. AMC - Army Materials Command
Rock Island, Arsenal, Illinois
Sierra, AD, California

These six (6) installations provided good geographic distribution with varying terrains, climates and sizes. Figure 1 shows this distribution.

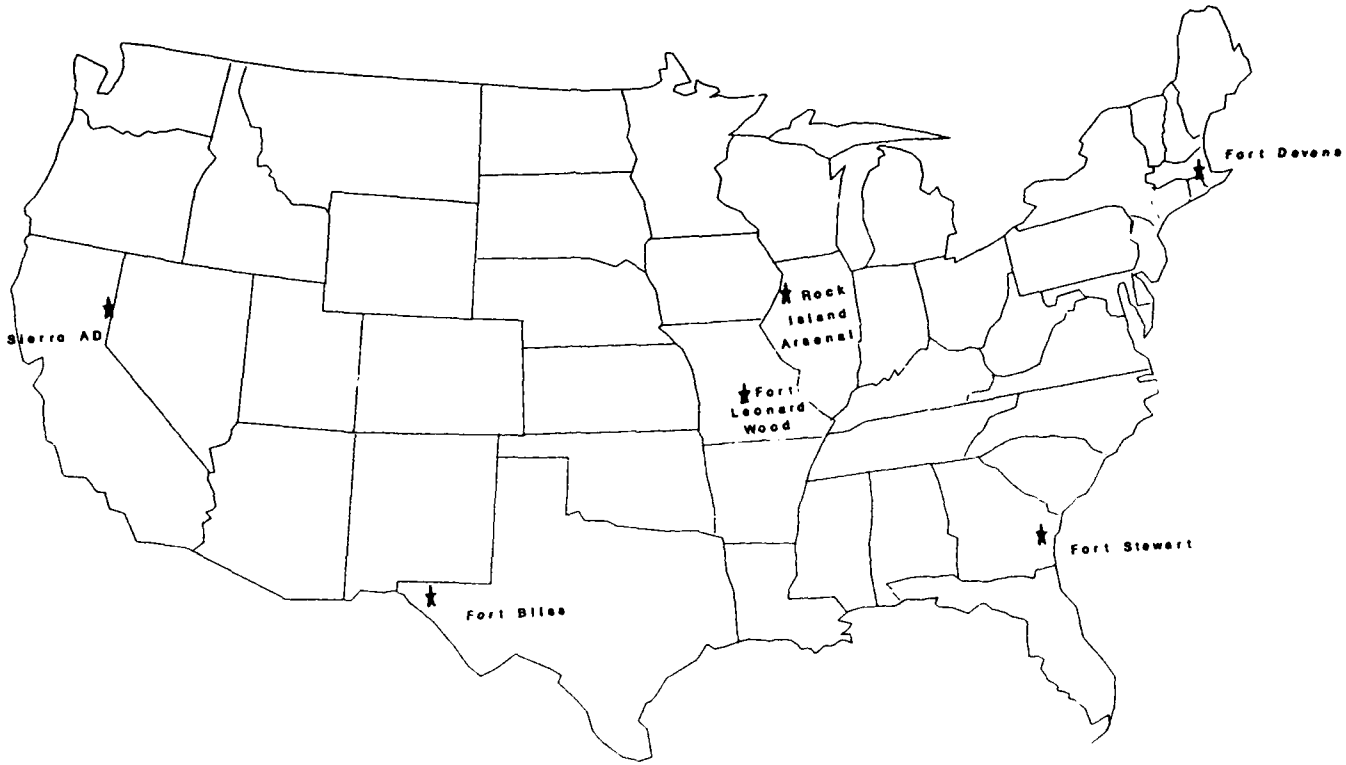


Figure 1. Army Installations Visited

## PART III: STUDY APPROACH

### Existing Maintenance Information

19. Current pavement maintenance operations by the Corps of Engineers provided the starting point in the development of a pavement maintenance system. The joint Departments of the Army, the Navy and the Air Force, USA, Technical Manual TM 5-624/NAVFAC MO-1021/AFM 85-8, Maintenance and Repair of Surface Areas provides guidance for the maintenance and repair of roads, streets, parking areas, walks and airfields. The manual discusses the types of surfaces and materials, causes and types of distress and different methods of maintenance and repair. The information in this manual presents a good overview of the scope of pavement maintenance, but it is not organized into maintenance work activities or planning guidelines. However, it provided an excellent base for developing an initial list of maintenance items and work activities.

20. Another source on pavement maintenance is the joint Department of the Army, the Navy and Air Force handbook of Engineered Performance Standards for Real Property Maintenance Activities TB 420-22/NAVFAC P-712.0/AFM 85-51 that cover roads. This handbook provides guidance in estimating person hour requirements for workers to perform typical facilities maintenance tasks. However, for roads only five task areas, work activities, are listed. Within each task area the work performed is broken down into minute work units for estimating person hour requirements. Separate estimates are made for individual work steps. Typical work steps for "Replacing Bituminous Surface" include operate pneumatic hammer, remove broken material, sweep area, apply tack coat, place bituminous material and hand tamp. This type of detail may be beneficial for planning and evaluating selected type of maintenance work but has not proven effective, or required, for planning and evaluating routine pavement maintenance work performed on a day-to-day basis.

21. The American Public Works Association (APWA) manual, Street and Highway Maintenance Manual, contains detailed information on pavement maintenance operations and performance standards for selected maintenance work activities. Several cities and counties have utilized this manual to assist them in developing and implementing a maintenance management system for their agency.

22. Other sources of existing information on maintenance management systems include state and local transportation agencies throughout the United States and national agencies, such as the National Park Service which has developed a servicewide maintenance management system that is being implemented in over 300 parks throughout the nation. This system encompasses roads, trails, walks, grounds and all physical features of the park that must be maintained.

23. These existing sources of maintenance management information were utilized to develop initial lists of maintenance items and work activities.

## Installation Visits

24. Installation visits were coordinated through the Directorate of Engineering and Housing (DEH) at each installation. A key contact person responsible for pavement maintenance was identified and arrangements finalized for an on-site visit to review pavement maintenance operations at the installation.

25. Prior to the installation visits the preliminary lists of pavement maintenance items work activities developed from existing information was transmitted to the installation, together with draft definitions for each work activity that describe the type of work included in each work activity. An agenda of subjects to be covered during the installation visit was also provided to the maintenance contact. These subjects included:

a. Current budgeting and work planning process.

b. Work reporting forms and procedures.

(1) Labor, equipment and materials.

(2) Work accomplished.

c. Available inventory of pavement maintenance items (features to be maintained).

d. Personnel and equipment available for maintenance.

e. Types and magnitude of pavement maintenance performed.

(1) DEH personnel.

(2) Troops.

(3) Commercial contract.

f. Labor, equipment and materials used to perform specific work activities.

26. The preliminary lists of maintenance items and work activities were reviewed during the installation visits and modified to reflect pavement maintenance requirements at the installation being visited. The level of work effort normally associated with each work activity was recorded as high, medium or low. Additionally, it was determined whether the maintenance was performed with in-house personnel, commercial contract or a combination of both.

27. The Commercial Activity (CA) process, which involves routine maintenance being performed by private contractor, was very active at the installations visited. One installation was performing all pavement maintenance by a private contractor and another was scheduled to start complete contractor pavement maintenance on April 1, 1988. At the other installations private contract maintenance effort ranged from major to minor. Routine maintenance work typically being contracted includes traffic line striping, roadside mowing and crack/joint sealing. Cyclic type of maintenance such as resurfacing, seal coating and pavement rehabilitation are also normally contracted.

28. PAVER, the pavement management system being implemented by the Corps of Engineers was found to be in varying levels of implementation at the six installations. PAVER was fully implemented and being utilized at two installations; implementation was underway at two locations; and two installations had not initiated implementation efforts. PAVER is being operated by a private contractor at one installation and by DEH personnel at the other location. Personnel at these locations were complimentary of PAVER application as an objective rating of pavement condition to develop cyclic maintenance projects.

29. Field observations of maintenance work in progress and items to be maintained were made at the installations to ensure the maintenance items and work activities identified during this phase were representative of pavement facilities at the army installation. Pavement surface types observed included bituminous concrete, portland cement concrete, gravel and dirt. One unique feature found on army installations was the concrete tank crossings and intersections on bituminous roads, however, the maintenance requirements are the same as other concrete surfaces. Snow and ice control activities for airfield facilities differ from roadways due to aircraft movements and the prohibition of corrosive-type chemicals. The majority of the activities had been

identified on the preliminary listings and were confirmed during the installation visits.

30. Pavement maintenance at army installations is performed by the Roads Branch of DEH. Staffing for pavement maintenance at two installations has decreased significantly in the last ten (10) years. In terms of paved lane miles per person, staffing at these two locations is low compared to the other two installations performing pavement maintenance with in-house personnel. The equipment available at the installations included the types typically required to perform pavement maintenance and was well maintained.

## PART IV: MAINTENANCE MANAGEMENT ELEMENTS

### Maintenance Workload Planning

31. Maintenance workload planning is the first step in a comprehensive maintenance management system encompassing routine maintenance. It is based on the physical features to be maintained, maintenance work to be performed and resources (labor, equipment and materials) required to accomplish the planned maintenance workload. The identification of these basic maintenance management planning elements for pavement systems formed the overall objective for the first phase of maintenance management system development.

32. The maintenance management planning elements developed reflect the routine maintenance needs and requirements of the pavement systems at US Army installations. The elements identified represent requirements on a regional or national basis, as opposed to a specific installation. The intent was to define a sufficient number of the individual planning elements that would accommodate army installations throughout the United States. The following planning elements were developed.

a. Maintenance items.

b. Maintenance work activities.

c. Maintenance planning guidelines.

### Maintenance Items

33. Maintenance items are features of the pavement system requiring routine maintenance work. The types and amounts of routine maintenance to be performed at each army installation depend on the types of pavement features to be maintained at each installation. A typical army installation's inventory of maintenance items includes features such as:

a. Bituminous surface.

b. Unpaved surface.

c. Unpaved shoulder.

d. Mowable roadside.

e. Traffic sign.

34. The quantity of the maintenance item is expressed as units of measure for each feature. For example:

a. Bituminous surfaces are measured by lane miles.

b. Unpaved surfaces are measured as road miles.

c. Unpaved shoulders are measured by shoulder miles.

d. Mowable roadsides are measured in acres.

e. Traffic signs are counted (each).

Figure 2 shows the maintenance items and units of measure that were identified as being applicable for pavement facilities at army installations. The maintenance item and unit of measure that most directly affect the amount of routine maintenance work required are designated for each maintenance work activity to be performed at the installation.

## Maintenance Work Activities

35. The maintenance workload planning process is work activity oriented. A maintenance work activity is defined as a task or related tasks performed by maintenance personnel work as a team or crew to accomplish a specific single measurable result. Each type of work that uses a definite mix of labor, equipment and materials is defined as a separate work activity. For example, in surface maintenance, a work activity called "patching" is too general for good workload planning. Surface maintenance can involve pothole patching with hand tools and major full-depth patching with excavating equipment. Each is a separate work activity because the team composition (man/machine mix) and measurable results are different.

36. Work activities were identified for the major categories of pavement items to be maintained and specific services to be provided for these features. The major categories selected for maintenance work activities are:

a. Bituminous pavement.

b. Concrete pavement.

c. Other surfaces.

d. Shoulders.

e. Roadside.

f. Drainage.

g. Bridge surface.

h. Traffic services.

i. Snow and ice control.

| Maintenance Item | Unit of Measure |
|---|---|
| Bituminous Surface | Lane Mile |
| Concrete Surface | Lane Mile |
| Unpaved Surface | Road Mile |
| Unpaved Shoulder | Shoulder Mile |
| Troop Trail | Mile |
| Paved Roadway | Lane Mile |
| Runway Surface | Lane Mile |
| Roadway | Road Mile |
| Unpaved Ditch | Mile |
| Drainage Canal | Mile |
| Culverts and Inlets | Each |
| Mowable Roadside | Acre |
| Roadside Fence | Linear Feet |
| Bridge Deck | Square Yard |
| Timber Deck | Square Yard |
| Non-Timber Deck | Square Yard |
| Traffic Line Stripe | Miles |
| Traffic Sign | Each |
| Roadway Light | Each |
| Traffic Signal | Each |
| Runway Light | Each |
| Sidewalk and Walkway | Linear Feet |

Figure 2. Maintenance items and unit of measurement

Specific work activities were identified for each category. A total of 64 work activities was selected for routine pavement maintenance at army installations. Figure 3 lists the work activities for each category.

37. For each work activity a work unit was selected to measure the work performed by maintenance personnel. The work unit also is used to plan the total workload for each work activity. Typical work units include tons of material placed, square yards of surface patched, road miles bladed and number of signs repaired. The work unit should describe the results of the work effort and be practical and easy to measure. The field crew doing the work should be able to measure and record the amount of work with minimal effort. For some work activities, the work unit is best expressed as person hours. This is the case for work activities such as "Hand Mowing and Trimming" and "Remove Roadway Debris". It is difficult, if not impossible, to identify a work unit that is practical and reasonable to measure and is representative of the nature of the work. The work units for each work activity are shown in Figure 3.

38. Work activities and their measurement units are directly related to inventory units to facilitate planning maintenance workloads. The relationship of the work to the inventory unit is shown in Figure 3.

39. The work activity name identifies the work, but is not necessarily fully descriptive of the work. For each work activity a general description of the work was prepared that further defines the work to be performed, the deficiency to be corrected, reasons for doing the work and the result to be achieved. The description should leave little doubt about what work is included in the activity. Figure 4 illustrates the activity descriptions. A complete list is contained in Appendix A.

## Maintenance Planning Guidelines

40. One of the basic objectives of a maintenance management system is to ensure effective and economical use of labor, equipment and materials in the performance of pavement maintenance activities. This is accomplished, in part, by developing planning guidelines for planning and organizing work according to the work methods and resources established to perform the work activities in an effective and economical manner. An important requirement is

| WORK ACTIVITY | | WORK UNIT | MAINTENANCE UNIT AND ITEM (Inventory Unit) |
|---|---|---|---|
| BITUMINOUS PAVEMENT | | | |
| 1110 | Pothole Patching | Tons | Lane Mile Bituminous Surface |
| 1120 | Partial-Depth Patch | Tons | Lane Mile Bituminous Surface |
| 1130 | Full-Depth Patch | Tons | Lane Mile Bituminous Surface |
| 1140 | Surface Treatment Patch | Square Yards | Lane Mile Bituminous Surface |
| 1150 | Surface Treatment | Square Yards | Lane Mile Bituminous Surface |
| 1160 | Skid Resistance Treatment | Square Yards | Lane Mile Bituminous Surface |
| 1170 | Crack Sealing | Gallons Sealant | Lane Mile Bituminous Surface |
| 1180 | Treat Bleeding Asphalt | Square Yards | Lane Mile Bituminous Surface |
| 1190 | Treat Fuel Spillage | Square Yards | Lane Mile Bituminous Surface |
| CONCRETE PAVEMENT | | | |
| 1310 | Bituminous Patching of PCC | Tons | Lane Mile Concrete Surface |
| 1320 | Partial-Depth Patch of PCC | Square Yards | Lane Mile Concrete Surface |
| 1330 | Full-Depth Patch of PCC | Square Yards | Lane Mile Concrete Surface |
| 1340 | Epoxy Patching | Square Yards | Lane Mile Concrete Surface |
| 1350 | Bituminous Undersealing | Square Yards | Lane Mile Concrete Surface |
| 1360 | Crack/Joint Sealing | Linear Feet | Lane Mile Concrete Surface |
| 1370 | Slab Replacement | Square Yards | Lane Mile Concrete Surface |
| 1380 | Slabjacking | Square Yards | Lane Mile Concrete Surface |
| 1390 | Slab Grinding | Square Yards | Lane Mile Concrete Surface |
| 1400 | Surface Grooving | Square Yards | Lane Mile Concrete Surface |
| OTHER SURFACES | | | |
| 1510 | Blade Unpaved Surface | Road Miles | Road Mile Unpaved Surface |
| 1520 | Add Gravel Unpaved Surface | Road Miles | Road Mile Unpaved Surface |
| 1530 | Cement/Lime Stabilization | Road Miles | Road Mile Unpaved Surface |
| 1540 | Dust Control | Road Miles | Road Mile Unpaved Surface |
| 1550 | Blade Troop Trails | Trail Miles | Miles Troop Trails |
| SHOULDERS | | | |
| 1710 | Patch Paved Shoulder | Tons | Miles Paved Shoulder |
| 1720 | Seal Coating | Square Yards | Miles Paved Shoulder |
| 1730 | Blade Unpaved Shoulder | Shoulder Miles | Miles Unpaved Shoulder |
| 1740 | Add Gravel Unpaved Shoulder | Tons | Miles Unpaved Shoulder |

Figure 3. Pavement Maintenance Work Activities

| WORK ACTIVITY | | WORK UNIT | MAINTENANCE UNIT AND ITEM (Inventory Unit) |
|---|---|---|---|
| ROADSIDE | | | |
| 2110 | Roadway Sweeping | Lane Miles | Lane Miles Paved Roadway |
| 2120 | Runway Sweeping | Lane Miles | Lane Miles Runway |
| 2130 | Magnet Sweeping | Lane Miles | Lane Miles Paved Surface |
| 2140 | Machine Mowing | Acres | Acres Mowable Area |
| 2150 | Hand Mowing/Trimming | Person Hours | Acres Mowable Area |
| 2160 | Spraying/Weed Control | Person Hours | Acres Mowable Area |
| 2170 | Reseeding and Sodding | Square Yards | Acres Mowable Area |
| 2180 | Erosion Control | Person Hours | Acres Mowable Area |
| 2190 | Litter Pickup | Bags Litter | Acres Grounds Area |
| 2200 | Brush and Tree Cutting | Person Hours | Acres Grounds Area |
| 2210 | Repair Fences | Linear Feet | Linear Feet Fence |
| 2220 | Clean Grit Chambers | Person Hours | Number Wash Racks |
| 2230 | Remove Roadway Debris | Person Hours | Miles Roadway |
| DRAINAGE | | | |
| 3110 | Clean/Reshape Ditches | Ditch Miles | Miles Unpaved Ditch |
| 3120 | Clean Culverts/Inlets | Number Culverts/Inlets | Number Culverts/Inlets |
| 3130 | Repair/Replace Culverts | Number Culverts/Inlets | Number Culverts/Inlets |
| 3140 | Place Riprap | Person Hours | Miles Unpaved Ditch |
| 3150 | Clean/Clear Canals | Linear Feet | Miles Canal |
| BRIDGE SURFACE | | | |
| 4110 | Clean Bridge Surface | Square Yards | Square Yards Bridge Deck |
| 4120 | Repair Timber Deck | Square Yards | Square Yards Timber Deck |
| 4130 | Repair Bridge Deck | Square Yards | Square Yards Non-Timber Deck |
| TRAFFIC SERVICES | | | |
| 5110 | Traffic Line Striping | Linear Feet | Miles Traffic Lines |
| 5120 | Repair Signs | Number Signs | Number Traffic Signs |
| 5130 | Repair Guardrail | Linear Feet | Linear Feet Guardrail |
| 5140 | Repair Lights | Number Lights | Number Lights |
| 5150 | Repair Signals | Number Signals | Number Signals |

Figure 3. Pavement Maintenance Work Activities

(Continued)

| WORK ACTIVITY | | WORK UNIT | MAINTENANCE UNIT AND ITEM (Inventory Unit) |
|---|---|---|---|
| SNOW AND ICE CONTROL | | | |
| 6110 | Plow Roadways | Roadway Miles | Miles Roadway |
| 6120 | Plow Runways | Person Hours | Lane Miles Runway |
| 6130 | Rotary Snow Removal | Person Hours | Lane Miles Paved Surface |
| 6140 | Load/Haul Snow | Person Hours | Lane Miles Paved Surface |
| 6150 | Sweep Snow from Runways | Person Hours | Lane Miles Runway |
| 6160 | Apply Chemicals/Abrasives - Ice Control | Tons | Lane Miles Paved Surface |
| 6170 | Clear Snow/Ice Runway Lights | Number Lights | Number Runway Lights |
| 6180 | Clear Walkways | Linear Feet | Linear Feet Sidewalk |
| 6190 | Install/Remove Snow Fence | Linear Feet | Number Locations |
| 6200 | Install/Remove Snow Markers | Number Markers | Number Locations |

Figure 3. Pavement Maintenance Work Activities

(Continued)

MAINTENANCE WORK ACTIVITY DEFINITIONS

BITUMINOUS PAVEMENT

1110 Pothole Patching

Patching small areas (25 sq. ft., or less) of bituminous surfaces with asphalt material to correct abrupt depressions, potholes, edge failures and other potential surface hazards to provide a smooth paved surface.

Work Unit: Tons Asphalt Concrete
Inventory Unit: Bituminous Lane Mile

1120 Partial-Depth Patch

Removal and replacement of large areas (more than 25 sq. ft.) of failed bituminous surfaces excluding the base course to provide a smooth, structurally sound pavement surface and to eliminate safety hazards.

Work Unit: Tons Material
Inventory Unit: Bituminous Lane Mile

1130 Full-Depth Patch

Removal and replacement of large areas (more than 25 sq. ft.) of failed bituminous surfaces and base courses to provide a smooth, structurally sound pavement surface and to eliminate safety hazards.

Work Unit: Tons Material
Inventory Unit: Bituminous Lane Mile

1140 Surface Treatment Patch

Patching small areas (25 sq. ft., or less) of bituminous surfaces with one or more applications of hot liquid asphalt and aggregate to correct extensive cracking, raveling, spalling and shallow surface failures to restore surface and prevent further deterioration.

Work Unit: Square Yards
Inventory Unit: Bituminous Lane Mile

1150 Surface Treatment

Placement of surface treatments on sound bituminous surfaces to seal cracks, correct minor surface depressions and to provide a new wearing surface.

Work Unit: Square Yards
Inventory Unit: Bituminous Lane Mile

Figure 4. Sample Maintenance Work Activity Definitions

that the guidelines are practical and easily communicated to first-line supervisors and field crews.

41. Planning guidelines support work program and budget development by providing the framework for estimating the labor, equipment, materials, and the expected daily productivity for each activity. The guidelines also provide information about:

a. What work is to be done.

b. When the work is to be done.

c. Why the work is to be done.

d. What basic work steps are to be done.

These data, for each activity, support managers and supervisors in their efforts to maximize the use of limited resources in accomplishing maintenance work programs.

42. Planning guidelines were developed for each identified routine maintenance work activity. These guidelines have been developed from data abstracted from the Army's Manual, "Maintenance and Repair of Surface Areas" (TM 5-624), interviews and work observations at the six installations visited and planning guideline data available from other sources such as the American Public Works Association and the National Park Service. Information contained in the planning guidelines are representative of routine pavement maintenance operations and sound maintenance practices. The guidelines reflect current maintenance practices for army pavement systems and could be modified for use at a specific installation with minimal effort.

43. Planning guideline data are presented in a format as shown in Figure 5. Descriptions of the information included in each planning guideline are presented in the following sections:

a. Work activity. The title of the maintenance work activity as shown on the activity list.

b. Code. A numeric identification code as shown on the activity list.

c. Description. The narrative description of work to be performed and results to be achieved.

d. Maintenance item. The pavement item to be maintained and its unit of measure.

e. Planning criteria. Information about when to schedule work, and additional guidance about the severity of the deficiency or priority of the work. Other important scheduling or coordination information may also be presented. The monthly section

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Pothole Patching | CODE | 1110 |
|---|---|---|---|

**DESCRIPTION**

Patching small areas (25 sq. ft, or less) of bituminous surfaces with asphalt concrete material to correct abrupt depressions, potholes, edge failures and other potential surface hazards to provide a smooth paved surface.

**MAINTENANCE ITEM** Bituminous Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

Perform when potholes and other hazards are identified. Schedule the work by geographical area, except for emergencies. Hot-mix asphalt concrete is the preferred patching material when available.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Vehicle Operator | 1 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Vibratory Tamper | 1 |
| Heater-Blower | 1 |
| Saw or Air Hammer | 1 |
| Straight Edge | 1 |

**MATERIAL**

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material

**DAILY PRODUCTION**

3 - 5 Tons Asphalt Concrete

## REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977. Pg. 3-37, 38, par. 3-5.6.7.1-3.

Figure 5. Planning Guideline

| WORK ACTIVITY | Pothole Patching | CODE | 1110 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Use truck warning lights and other traffic controls as required.
2. Mark area to be removed at least six inches beyond the damaged area.
3. Saw or jack hammer around the marked area.
4. Square the edges to provide a vertical face on the area to be patched.
5. Remove all loose debris from area to be patched.
6. Level and compact the base.
7. Make sure the area is dry. Use heater-blower if necessary.
8. Spray tack lightly on bottom and sides of area to be patched.
9. Place and rake premix in layers not exceeding 2 inches, compacting each layer with tamper.
10. Check with straight edge to make sure patch is level with surrounding surface.
11. Clean area and remove signs and safety devices.

**ENGINEERED PERFORMANCE STANDARD**

6.00000 Hours per Ton

Figure 5. Planning Guideline
(Continued)

provides an indication of the typical calendar distribution of the work activity.

f. Resources requirements - personnel. The numbers and types of personnel required to perform the work are listed. Specific personnel classifications have not been used. Titles related to work assignments and required skills have been used instead for these performance standards. Quantity is based on average conditions for flagging and materials hauling. Personnel may be added or deleted to satisfy special traffic, safety, or hauling requirements.

g. Resource requirements - equipment. The major types of equipment and the number required to perform the work are listed. The lack of availability of a specific type of equipment may require a substitution. The material haul distance for a specific work site may affect the actual number of trucks required.

h. Resource requirements - material. The major materials typically required to perform the work are shown. Requirements may vary depending on the type of deficiency to be corrected.

i. Daily production. The estimated amount of work to be accomplished in an 8 hr day using the recommended work procedure, crew, equipment and materials. This estimate is presented in terms of a quantity of work units and is shown as a range recognizing that day-to-day accomplishments will vary.

j. References - methods and safety. Technical references for manuals, specifications, standards, safety criteria and other information to be considered in planning the work activities.

k. Recommended work procedure. On the back of the performance standard is a recommended work procedure to follow when planning and accomplishing the work. These procedures may be modified to fit a specific work location or condition. However, the basic steps should be performed to ensure the deficiency is corrected properly and/or the desired quality of workmanship is obtained.

l. Engineered performance standard. Person-hours per unit of work accomplishment.

44. Appendix B contains the planning guidelines developed for the pavement maintenance work activities identified during this phase of maintenance system development. These planning guidelines will not apply uniformly at all army installations due to variations in factors such as terrain, weather, installation size, installation missions and available labor, equipment and material resources. As required, these guidelines can be modified to develop installation-specific planning guidelines which address the individual installation situation.

45. The resource requirements for personnel, equipment and material should represent the most effective and efficient complement of resources to accomplish each work activity. Resources, and quantities, shown on the planning guidelines represent average conditions and actual use may vary to satisfy special work site locations. Appendix C contains the resource lists for personnel, equipment and material classifications used in the planning guidelines and the measurement units used for the resource.

## PART V: ANALYSIS AND DEMONSTRATION

46. Current use of maintenance management principles and the potential for application of a comprehensive maintenance management system were reviewed and analyzed. This analysis was not directed toward an audit of existing maintenance operations and work management procedures, as only six (6) army installations were contacted and visited on site. However, these installations were selected as being representative of the army installations throughout the United States.

### Existing Routine Maintenance Operations

47. Routine maintenance work for pavement systems is performed by in-house personnel, by private contractors and by a combination of both. The annual work program and budget for routine pavement is included in the Operations and Maintenance portion of the Annual Work Program (AWP) for the installation. The AWP does not identify every project to be performed during the year, but rather is a planning document which reflects the best information available when the work program is developed.

48. The maintenance work program consists of estimated personnel and material costs for standing operations, service orders, individual jobs/projects and emergency work as well as private contract work. Equipment requirements typically are estimated as a separate line item in the budget. These estimates are based on historical data, field inspections and other identified needs. The annual routine maintenance work program does not appear to be based on accomplishing a designated amount (quantity) of routine maintenance--except when the commercial activity (CA) process is involved.

49. The CA process involves identifying and quantifying the specific types of routine maintenance work to be performed during the year. Sufficient detail is provided to permit private contractors to bid on performing the work. The Facilities Engineer also prepares a bid to perform the routine maintenance work with in-house personnel. A private contractor must bid more than 10 percent less than the in-house bid in order to receive the contract for the routine maintenance work. At the two installations where private contractors had been awarded contracts for routine maintenance, the roads and

pavement maintenance personnel appeared to have minimal input into the in-house bid for the pavement maintenance portion.

50. Work authorization, or organizing and directing, is provided through three (3) separate categories of work: service orders, standing operations orders and individual job orders.

a. Service Orders (SOs). Small service-type maintenance and repair jobs not exceeding 16 person-hours of labor and $350 material costs. Includes emergencies and work requiring immediate action.

b. Standing Operations Orders (SOOs). Work of a continuing, year-around basis such as utility plant operations or custodial services. Road and pavement maintenance usually is not performed by SOO except for repetitious type work performed during certain months, such as snow removal operations.

c. Individual Job Orders (IJOs). All maintenance and road repair work involving more than 16 person-hours and $350 material costs, but not in excess of the installation commander's approval authority.

Proper use of these categories provides an effective work authorization and organization component for maintenance management.

51. IJO resource estimates are not performed by maintenance operations personnel, but rather by planner-estimators using Engineered Performance Standards (EPS) on a task-by-task basis or general person-hour estimates based on experience. Engineered Performance Standards are the estimated number of person-hours required to accomplish a certain unit of work according to a specified method and to an acceptable quality. A recognized limitation in using EPSs for estimating routine pavement maintenance work is that only a limited number of EPSs are available. Field personnel at the installations visited indicated there were wide variations in estimated resources on IJOs and the resources actually required to perform the work. There were doubts on how the estimated resources were developed.

52. Routine pavement maintenance does not lend itself to a rigid, mechanistic application of industrial engineering principles for measuring work production. This was recognized over 25 years ago by the professionals pioneering the development and application of maintenance management concepts. Typically, work production is expressed as "average daily production" for a compliment of resources (labor, equipment, materials) to accomplish during a standard work day. The work performed includes all the separate work tasks (work activity) required to produce the completed whole job with a single unit

of measure performed by a team or crew. The reasons for this approach were twofold. First, administrative and management costs needed to be kept in line with the costs of performing the work. Second, procedures had to be simple for effective communications at the working level.

53. Priorities are assigned to SOs and IJOs as they are received and approved for work assignment. Various work scheduling approaches were used by the installations visited. These approaches ranged from formal weekly schedules to daily scheduling/work assignments. The key factors affecting maintenance scheduling seemed to be installation size and supervisory personnel preference.

54. Reporting of maintenance work accomplished varied among the installations contacted. Some used the phase and task codes of the Integrated Facilities System (IFS). Others had developed their own task codes that grouped the individual tasks involved in completing a work function (activity). In some cases, work accomplishment was reported in measurable work units for each task. All installations used the form Labor and Equipment (DA FORM 4288) to report labor and equipment used.

55. Installations with an IFS have the capability to develop several standard evaluation reports including the following:

a. Labor and Equipment Report - Daily list of work performed by person for all SO, WO, JO.

b. SO Backlog Report - Lists backlog of Service Orders by task code and priority.

c. SOO Shop Schedule Report - Shows estimated person-hours versus completed person-hours.

d. Projects-in-Progress Schedule - Status of IJOs.

Pavement maintenance personnel indicated these reports were of limited use to them in evaluating their work efforts. The reports did not list work accomplishment or cost per unit of work and the reports were not always current. Some supervisors prepared manual evaluation reports.

## Application of Maintenance Management Elements

### Maintenance management overview

56. Maintenance management systems provide a formalized process and procedures for managing maintenance operations for various facilities such as pavements, roads, parks, utilities and buildings. Although the magnitude of

the maintenance workload varies from area to area, the same procedures are adaptable to installations of all sizes and with differing responsibilities. The four major functions of maintenance management systems are:

a. Planning.

b. Organizing.

c. Directing.

d. Controlling.

These are systems that focus on the field work and first-line supervision and have capability to summarize for higher levels of management.

57. Maintenance management elements are developed to reflect the maintenance requirements and conditions at the specific installation. Maintenance management provides managers and supervisors with effective procedures to manage and control their maintenance responsibilities. Microcomputers are often used to store relevant maintenance data, perform calculations and prepare reports. By eliminating the need for tedious, time consuming manual tasks, the maintenance staff is available to perform important field direction and other maintenance work.

58. The planning, organizing, directing and controlling functions are shown in the maintenance management flowchart in Figure 6. Each function has several components which are integral to maintenance management systems.

59. Planning. The planning function provides a work program and budget that reflects management decisions and objectives for maintenance activities. This process includes the development of several planning elements that are organized and compiled to form a work program and budget. These elements are:

a. Organization data.

b. Work activities.

c. Inventory and condition assessment.

d. Planning guidelines.

e. Service levels*

f. Resources and unit costs.

Work activities and performance standards for pavements at army Installations have been developed during this study.

60. Organizing. As shown in Figure 6, the organizing elements are:

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* Frequencies of maintenance work or annual quantities of maintenance work per unit of inventory.

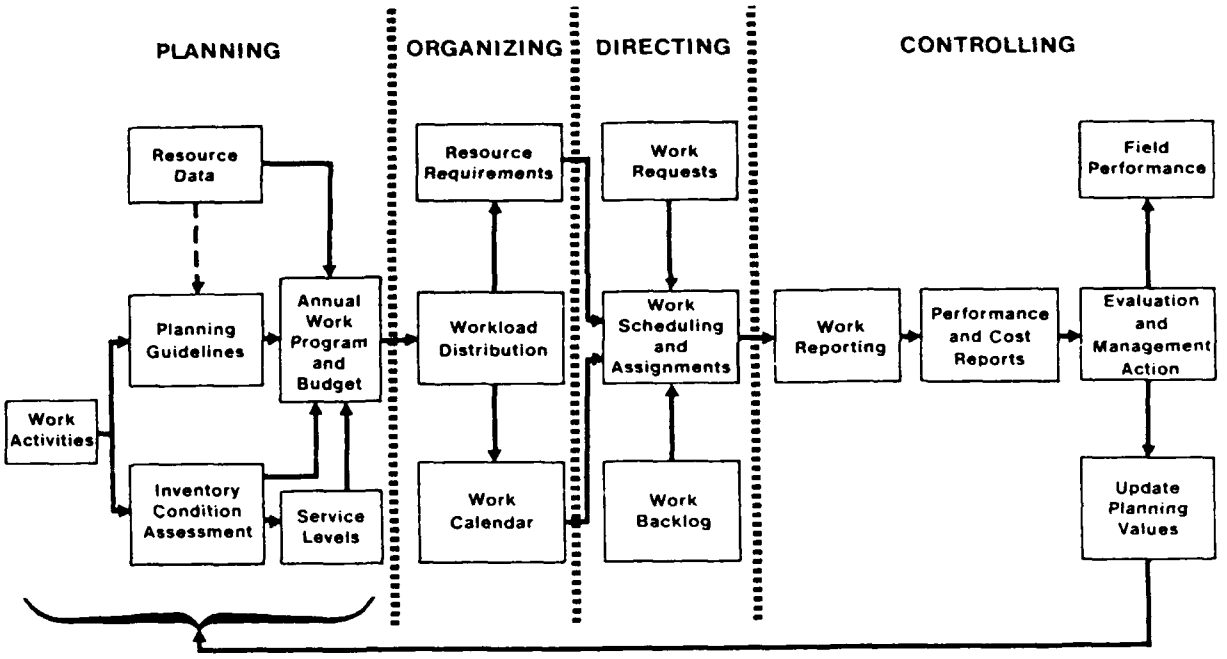


Figure 6. Basic Maintenance Management Information Flow

a. Workload distribution.

b. Work calendar.

c. Resource requirements.

Workload distribution procedures are used to allocate the total annual work program to the months the work will or should be performed. The need for staffing to match seasonal workload variations is readily apparent from this process. A work calendar to be used for preparing short-term schedules is provided. The monthly requirements for labor, equipment and materials needed to do the annual work program are identified.

61. Directing. The work directing function involves identifying and documenting work needs, preparing short-term work schedules and assigning work to the maintenance staff. These elements involve the use of:

a. Work calendar status reports.

b. Work requests and backlog reports.

c. Knowledge of other factors affecting maintenance activities.

These work directing procedures assist the managers and supervisors in their efforts to accomplish the work program objectives in an efficient and cost effective manner.

62. Controlling. The work controlling function consists of monitoring the progress of work performed in comparison to the plan and taking action to direct or redirect future efforts. Procedures are provided for collecting, evaluating and using work performance data reported by field maintenance personnel. Work performance and cost reports are available for managers and supervisors to use in analyzing and evaluating maintenance work efforts in their respective areas of responsibility.

63. Maintenance management systems (MMS) provide detailed documentation of the maintenance workload and help identify when specific activities should be performed. MMS allows the work program to be easily modified when funding availability or other conditions change. MMS provides guidance in scheduling work and provides more timely and useful information to maintenance managers.

64. Maintenance management systems are designed to assist maintenance managers in their efforts to plan, organize, direct and control the maintenance program. It is a tool for managers to use in setting objectives, preparing programs, and carrying out those programs. Maintenance management is a work management system with associated cost data.

## Sierra Army Depot Demonstration

65. Unless pavement maintenance data and planning guidelines are used to assist managers in more effectively accomplishing the maintenance mission, the value of expending effort to collect or develop this data is questionable. Therefore, a methodology for using this data to develop an annual maintenance program which will assist the managers in planning, organizing, directing, and controlling scarce resources to perform pavement and grounds maintenance is presented for the Roads and Grounds Branch of the Buildings, Grounds and Utilities Division of the Directorate of Engineering and Housing, Sierra Army Depot. The program which was developed is based on information provided by the Depot but is only representative of their operations and is not intended to depict, accurately, their current financial or operating programs.

### Maintenance management principles involved

66. Focused Management. All of the work activities performed by the Roads and Grounds Branch were identified. Then using the principle of the "vital few versus trivial many" shown in Figure 7, those activities which required the most effort, money or management were selected to be included in the program as specific activities. The remainder of the activities were grouped into appropriate "General" activities in the work program. As a result of this selection process, the numerous bituminous pavement activities performed were included in the activity, General Bituminous Maintenance, because no one bituminous maintenance activity was large enough to single out for managerial emphasis. As Sierra, this is due to the large contract maintenance and repair program currently underway which reduces the amount of work performed on pavements by the in-house staff. The identification of the "Vital Few" activities focuses the managers attention in those areas where improvements or degradations in performance will significantly affect the overall program.

67. Performance based. Planning an annual work program is most effective if the planning effort is based on the type and amount of work to be accomplished. Identification of the total amount of a work activity to be performed upon the entire inventory during the year provides the basis for a rational approach to the allocation and distribution of resources necessary to accomplish that work. Realistic planning guidelines for the individual work

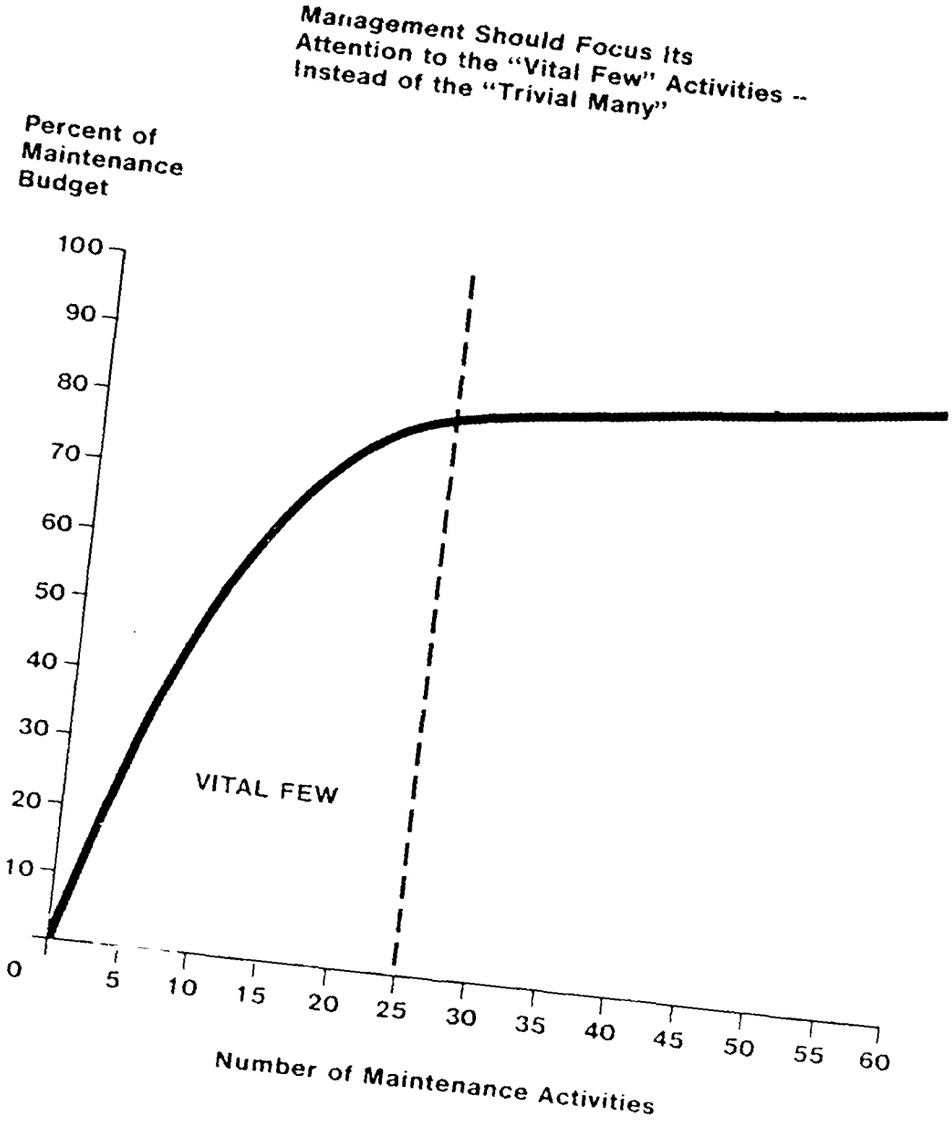


*Figure 7.* The Importance of the "Vital Few" Activities Within the Maintenance Budget

activities based on the use of expected resources simplifies the determination of the amount, cost and time distribution of resources required to accomplish a year's amount of work.

Planning-developing the work program and budget

68. Selection of Work Activities. The work activities listed in Figure 3, Part IV, provided the basis for selecting the work activities for Sierra Army Depot. From the total list of 64 routine maintenance work activities, 20 were selected. An additional 6 activities for railroads, landfills, supervision and administration were selected. An additional 6 activities for railroads, landfills, supervision and administration, 20 were selected. An additional 6 activities for railroads, landfills, supervision and administration were selected to account for the total work performed by the Branch. Six of the activities are "General" activities which combine the numerous small activities performed. The list of the selected activities with the appropriate work and inventory units is shown in Figure 8.

69. Identification of the maintenance inventory. Based on the inventory units of the selected work activities, an inventory of the Depot was conducted from records. (For the purposes of this demonstration program the inventory is very approximate.) As can be seen the detail of inventory required to plan the maintenance program is determined by the selected significant work activities. This inventory is shown in Figure 9. As will be shown later this inventory is divided into detail locations for work reporting.

70. Determination of service levels. A service level for a work activity is the amount of work (stated in the appropriate work unit) to be performed on an unit of inventory during the year. For example, if each acre of ground is to be mowed 12 times during the year, the service level for the work activity-grounds mowing would be 12 acres per acre. The annual work program for any work activity is simply the service level multiplied by the amount of inventory.

71. The service levels for the work activities at Sierra Army Depot were determined through discussions with the appropriate foremen in the Roads and Grounds Branch. Ideally, these service levels would be based on a determination of the condition of the inventory. These service levels would reflect the amount of work required to bring the inventory into a desired

| | WORK ACTIVITY | INVENTORY UNIT | WORK UNIT |
|---|---|---|---|
| 1195 | Gen Bit Pvmnt Maint | Bituminous Road Mile | Person Hours |
| 1395 | Gen Conc Pvt Rpr | Concrete Surface Square Yards | Person Hours |
| 1510 | Blade Unpvd Surfcs | Unpaved Road Mile | Road Mile |
| 1520 | Add Gravel Unpvd Srfc | Unpaved Road Mile | Road Mile |
| 1540 | Dust Control | Unpaved Road Mile | Road Mile |
| 1730 | Blade Unpvd Shldrs | Unpaved Shoulder Mile | Shoulder Mile |
| 1820 | Maint RR Switch | Number RR Switch | Number Switches |
| 1830 | Repair RR Track | RR Track Mile | Track Mile |
| 2110 | Roadway Sweeping | Paved Road Mile | Road Mile |
| 2120 | Runway Sweeping | Runway/Taxiway Square Yards | Square Yards |
| 2140 | Machine Mowing | Mowable Acres | Acres |
| 2150 | Hand Mowing Trimming | Mowable Acres | Person Hours |
| 2151 | Lawn Mowing | Mowable Lawn Acres | Acres |
| 2160 | Spraying/Weed Control | Maintained Grounds Acres | Person Hours |
| 2210 | Repair Fences | Fence Linear Feet | Linear Feet |
| 2230 | Remove Rdwy Debris | Total Roadway Mile | Person Hours |
| 2290 | Gen Grounds Maint | Maintained Grounds Acres | Person Hours |
| 3190 | Gen Drainage Maint | Year | Person Hours |
| 5120 | Repair Signs | Number Signs | Number Signs |
| 5190 | Gen Traffic Srvc Mnt | Year | Person Hours |
| 6290 | Gen Snow/Ice Control | Year | Person Hours |
| 7110 | Haul Trash/Garbage | Number Garbage Trucks | Truck Loads |
| 7120 | Maintain Landfill | Landfill Acres | Person Hours |
| 9100 | Supervision | Year | Person Hours |
| 9200 | Admin/Lv/Trng | Year | Person Hours |

Figure 8. Selected Work Activities for Sierra Army Depot

DeLEUW, CATHER & Co.
Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE

FEATURE INVENTORY DATA

Page: 1
Date: 09/08/88

| CODE | FEATURE | MEASRMNT UNITS | MGMT UNIT | TOTAL INVENTORY | CONDITIONS 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| 1110 | BITUMINOUS ROAD | MILES | ROAD | 260.00 | .00 | .00 | .00 |
| 1300 | CONCRETE PAVEME | K SQ YDS | ROAD | 200.00 | .00 | .00 | .00 |
| 1310 | RUNWAY/TAXIWAY | K SQ YDS | ROAD | 150.00 | .00 | .00 | .00 |
| 1500 | UNPAVED ROAD | MILES | ROAD | 300.00 | .00 | .00 | .00 |
| 1600 | TOTAL ROADWAY | MILE | ROAD | 760.00 | .00 | .00 | .00 |
| 1700 | UNPAVED SHLDRS | MILES | ROAD | 1,000.00 | .00 | .00 | .00 |
| 1820 | RR SWITCH | EA | ROAD | 10.00 | .00 | .00 | .00 |
| 1830 | RR TRACK | MILES | ROAD | 35.00 | .00 | .00 | .00 |
| 2000 | MNTND GROUNDS | ACRES | ROAD | 400.00 | .00 | .00 | .00 |
| 2100 | MOWABLE ROADSID | ACRES | ROAD | 400.00 | .00 | .00 | .00 |
| 2140 | MOWABLE LAWN | ACRE | ROAD | 150.00 | .00 | .00 | .00 |
| 2220 | FENCE | LIN FT | ROAD | 10,000.00 | .00 | .00 | .00 |
| 5120 | SIGNS | EA | ROAD | 300.00 | .00 | .00 | .00 |
| 7110 | GARBAGE TRUCK | EA | ROAD | 2.00 | .00 | .00 | .00 |
| 7120 | LANDFILL | ACRE | ROAD | 40.00 | .00 | .00 | .00 |
| 7130 | LEACHATE WELLS | EA | ROAD | 6.00 | .00 | .00 | .00 |
| 9100 | YEAR | EA | ROAD | 1.00 | .00 | .00 | .00 |

Figure 9. Sierra Army Depot Road Inventory

state of maintenance. Of course, in the real world, the resources required to achieve this state are seldom available so it is necessary to revise the desired service level to a planned service level achievable with the available resources. The difference between the desired and the planned service levels provides the basis for the quantification of the amount of maintenance which must be deferred.

72. Using the planning guidelines. The planning guidelines developed for the project provide the basis for determining the quantity and types of resources required to perform the amount of work in the annual work program. At Sierra Army Depot the developed planning guidelines were modified to reflect the available resources, the actual organization of crews and the production expected under the local working conditions. This data determined the number and the cost of the crew days to accomplish the annual work program. A compilation of this data for each work activity into one report is called the Work Program and Budget Report. The Work Program and Budget for Sierra Army Depot is shown in Figure 10.

73. Work program and budget report. The Work Program and Budget Report represents the product of the planning process. This report compiles and summarizes management decisions and objectives relative to the kinds and amounts of work to be planned; the productivity of the work force; and the costs of the planned work. These are key elements in the process of managing the routine pavement maintenance effort. Figure 10 shows the Work Program and Budget Report developed for Sierra to demonstrate the application of the planning elements. The following items explain in the data in the report.

a. Activity. The code and name of the work activity.

b. Feature inventory. The quantity and unit of the inventory item used in planning the activity.

c. Planned service level. The planned service level in terms of the number of work units per each unit of inventory.

d. PCT of DES. The value indicating that portion of the desired service level that is included in the planned work program.

e. Annual work quantity. The planned annual work quantity -- the product of the feature inventory, the service and it is stated in terms of the work unit for the activity.

f. Average daily production. The estimated average daily production established for the activity. It is used to calculate the estimated crew days required for the work. This number is divided into the annual work quantity.

DeLEUW, CATHER & Co. WORK PROGRAM AND BUDGET REPORT Page: 1
Work Management System Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

| CODE | ACTIVITY NAME | FEATURE INVENTORY QUANTITY | UNIT | PLANNED SERVICE LEVEL | | PCT OF DES | ANNUAL WORK QUANTITY | AVG DAILY PROD | CR SZ | PERSON DAYS | COST DISTRIBUTION LABOR | EQUIP | MAT/OTH | TOTAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT | 260.0 | MILES | 1.92 | PER HR | 38 | 499 | 30.0 | 3 | 49 | 5666 | 1071 | 2490 | 9227 |
| 1395 | GEN CONC PVT RPR | 200.0 | K SQ YDS | 1.24 | PER HRS | 82 | 248 | 20.0 | 2 | 24 | 2389 | 186 | 7750 | 10325 |
| 1510 | BLADE UNPVD SURFCS | 300.0 | MILES | 2.50 | ROAD MI | 100 | 750 | 9.0 | 2 | 124 | 16793 | 12928 | 0 | 29721 |
| 1520 | STAB UNPVD SRFC | 300.0 | MILES | .15 | ROAD MI | 60 | 45 | 4.0 | 4 | 45 | 5754 | 3876 | 3390 | 13020 |
| 1540 | DUST CONTROL | 300.0 | MILES | .30 | ROAD MI | 60 | 90 | 6.0 | 1 | 15 | 1590 | 998 | 1875 | 4463 |
| 1730 | BLADE UNPVD SHLDRS | 1000.0 | MILES | 2.00 | SHLDR MI | 66 | 2000 | 20.0 | 1 | 100 | 14860 | 12050 | 0 | 26910 |
| 1820 | MAINT RR SWITCH | 10.0 | EA | 10.00 | SWITCH | 83 | 100 | 3.0 | 2 | 66 | 6474 | 500 | 999 | 7973 |
| 1830 | REPAIR RR TRACK | 35.0 | MILES | .71 | MILE | 71 | 25 | .5 | 2 | 99 | 9662 | 746 | 994 | 11402 |
| 2110 | ROADWAY SWEEPING | 260.0 | MILES | 2.00 | ROAD MI | 50 | 520 | 12.0 | 2 | 64 | 8729 | 3642 | 0 | 12371 |
| 2120 | RUNWAY SWEEPING | 150.0 | K SQ YDS | 15.00 | K SQ YD | 75 | 2250 | 150.0 | 1 | 15 | 1590 | 908 | 0 | 2498 |
| 2140 | MACHINE MOWING | 400.0 | ACRES | 4.00 | ACRES | 80 | 1600 | 15.0 | 1 | 106 | 11310 | 2134 | 0 | 13444 |
| 2150 | HAND MOWING TRIMMING | 400.0 | ACRES | 1.25 | PER HRS | 62 | 500 | 20.0 | 2 | 50 | 4335 | 2075 | 0 | 6410 |
| 2151 | LAWN MOWING | 150.0 | ACRE | 9.60 | ACRES | 80 | 1440 | 10.0 | 2 | 288 | 24970 | 11952 | 0 | 36922 |
| 2160 | SPRAYING/WEED CONTRL | 400.0 | ACRES | .75 | PER HRS | 75 | 300 | 10.0 | 1 | 30 | 3180 | 600 | 4200 | 7980 |
| 2210 | REPAIR FENCES | 10000.0 | LIN FT | .30 | LIN FT | 75 | 3000 | 300.0 | 3 | 30 | 2794 | 355 | 2250 | 5399 |
| 2230 | REMOVE RDWY DEBRIS | 760.0 | MILE | 1.92 | PER HRS | 96 | 1459 | 30.0 | 3 | 145 | 16587 | 6041 | 0 | 22628 |
| 2290 | GEN GROUNDS MAINT | 400.0 | ACRES | .75 | PER HRS | 75 | 300 | 20.0 | 2 | 30 | 2891 | 225 | 300 | 3416 |
| 3190 | GEN DRAINAGE MAINT | 1.0 | EA | 200.00 | PER HR | 100 | 200 | 20.0 | 2 | 20 | 1927 | 355 | 300 | 2582 |
| 5120 | REPAIR SIGNS | 300.0 | EA | .25 | signs | 83 | 75 | 5.0 | 2 | 30 | 2891 | 225 | 1200 | 4316 |
| 5190 | GEN TRAFFIC SRVC MNT | 1.0 | EA | 125.00 | PER HRS | 83 | 125 | 20.0 | 2 | 12 | 1214 | 95 | 315 | 1624 |
| 6290 | GEN SNOW/ICE CONTROL | 1.0 | EA | 150.00 | PER HRS | 100 | 150 | 30.0 | 3 | 15 | 1707 | 780 | 350 | 2837 |
| 7110 | HAUL TRASH/GARBAGE | 2.0 | EA | 150.00 | TRUCK LD | 75 | 300 | 3.0 | 1 | 100 | 14860 | 12000 | 0 | 26860 |
| 7120 | MAINTAIN LANDFILL | 40.0 | ACRE | 6.00 | PER HRS | 100 | 240 | 10.0 | 1 | 24 | 3566 | 7877 | 0 | 11443 |
| 9100 | SUPERVISION | 1.0 | EA | 1500.00 | PER HR | 100 | 1500 | 10.0 | 1 | 150 | 22530 | 2250 | 0 | 24780 |
| 9200 | ADMIN/LV/TRNG | 1.0 | EA | 4000.00 | PER HR | 100 | 4000 | 120.0 | 12 | 399 | 45571 | 0 | 0 | 45571 |
| | | | | | | | | | | TOTALS: | 2037 | 233840 | 83869 | 26413 | 344122 |
| | | | | | | | | | | | | OVERHEAD | .0% OF LABOR | | 0 |
| | | | | | | | | | | | | OVERHEAD | .0% OF TOTAL | | 0 |
| | | | | | | | | | | | | | TOTAL BUDGET | | 344122 |

Figure 10. Example Work Program and Budget Report for Sierra Army Depot

g. Crew size. This is the estimated average crew size to be assigned to the work activity.

h. Person days. The estimated number of person days needed to perform the work on the activity. It is the product of the crew size times the crew days.

i. Cost distribution. The estimated annual cost of labor, equipment, and materials/other for the activity. These costs are calculated by multiplying the cost per crew day for labor, equipment and materials/other times the planned crew days.

j. Total cost. The total cost of labor, equipment and materials/other for the activity.

k. Totals. These values represent the sum of the person days, labor, equipment, material/other, and total costs for all activities.

l. Overhead percent of labor. The additional calculated cost to reflect a budget additive as a function of the total labor cost. This additional cost is not reflected in the individual activities.

m. Overhead percent of total. The additional calculated cost to reflect a budget additive as a function of the total cost. Note--in the example, there is no total overhead cost shown.

n. Total budget. The estimated total cost to perform the planned work for the management unit, including any overhead additives.

74. Deferred maintenance report. The planned maintenance work program represents planned annual maintenance based on budgetary limits or available resources. The initial work program and budget calculations are made with the desired service levels (related to unconstrained requirements), or quantities of work that should be performed for optimum service. Adjustments are made in the desired service levels for selected work activities and are reflected in the planned service levels. The deferred maintenance report is a comparison of the work program derived from the desired and planned service levels. For each of the two programs the annual work quantities and total costs are displayed. The difference between these programs is calculated and displayed as deferred maintenance. With these data maintenance managers can readily identify the volume of work that is not included in the planned work program. The deferred maintenance report developed for Sierra is shown in Figure 11. The following items explain the data presented in the report.

a. Activity. The code and name of the activity.

b. Feature inventory. The quantity and unit of the inventory item used in planning the activity.

DeLEUW, CATHER & Co. DEFERRED BUDGET Page: 1
Work Management System Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

| ACTIVITY CODE | ACTIVITY NAME | FEATURE INVENTORY QUANTITY | UNIT | DESIRED PROGRAM ANNUAL WORK QTY | COST | PLANNED PROGRAM ANNUAL WORK QTY | COST | PCT | DEFERRED BUDGET ANNUAL WORK QTY | COST | PCT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT | 260.0 | MILES | 1300.00 PER HR | 24066 | 499.20 PER HR | 9227 | 38 | 800.80 PER HR | 14839 | 62 |
| 1395 | GEN CONC PVT RPR | 200.0 | K SQ YDS | 300.00 PER HRS | 12491 | 248.00 PER HRS | 10325 | 82 | 52.00 PER HRS | 2166 | 18 |
| 1510 | BLADE UNPVD SURFCS | 300.0 | MILES | 750.00 ROAD MI | 29721 | 750.00 ROAD MI | 29721 | 100 | 0.00 ROAD MI | 0 | 0 |
| 1520 | STAB UNPVD SRFC | 300.0 | MILES | 75.00 ROAD MI | 21661 | 45.00 ROAD MI | 13020 | 60 | 30.00 ROAD MI | 8641 | 40 |
| 1540 | DUST CONTROL | 300.0 | MILES | 150.00 ROAD MI | 7438 | 90.00 ROAD MI | 4463 | 60 | 60.00 ROAD MI | 2975 | 40 |
| 1730 | BLADE UNPVD SHLDRS | 1000.0 | MILES | 3000.00 SHLDR MI | 40365 | 2000.00 SHLDR MI | 26910 | 66 | 1000.00 SHLDR MI | 13455 | 34 |
| 1820 | MAINT RR SWITCH | 10.0 | EA | 120.00 SWITCH | 9576 | 100.00 SWITCH | 7973 | 83 | 20.00 SWITCH | 1603 | 17 |
| 1830 | REPAIR RR TRACK | 35.0 | MILES | 35.00 MILE | 16058 | 24.85 MILE | 11402 | 71 | 10.15 MILE | 4656 | 29 |
| 2110 | ROADWAY SWEEPING | 260.0 | MILES | 1040.00 ROAD MI | 24770 | 520.00 ROAD MI | 12371 | 50 | 520.00 ROAD MI | 12399 | 50 |
| 2120 | RUNWAY SWEEPING | 150.0 | K SQ YDS | 3000.00 K SQ YD | 3330 | 2250.00 K SQ YD | 2498 | 75 | 750.00 K SQ YD | 832 | 25 |
| 2140 | MACHINE MOWING | 400.0 | ACRES | 2000.00 ACRES | 16796 | 1600.00 ACRES | 13444 | 80 | 400.00 ACRES | 3352 | 20 |
| 2150 | HAND MOWING TRIMMIN | 400.0 | ACRES | 800.00 PER HRS | 10256 | 500.00 PER HRS | 6410 | 62 | 300.00 PER HRS | 3846 | 38 |
| 2151 | LAWN MOWING | 150.0 | ACRE | 1800.00 ACRES | 46152 | 1440.00 ACRES | 36922 | 80 | 360.00 ACRES | 9230 | 20 |
| 2160 | SPRAYING/WEED CONTR | 400.0 | ACRES | 400.00 PER HRS | 10640 | 300.00 PER HRS | 7980 | 75 | 100.00 PER HRS | 2660 | 25 |
| 2210 | REPAIR FENCES | 10000.0 | LIN FT | 4000.00 LIN FT | 7181 | 3000.00 LIN FT | 5399 | 75 | 1000.00 LIN FT | 1782 | 25 |
| 2230 | REMOVE RDWY DEBRIS | 760.0 | MILE | 1520.00 PER HRS | 23606 | 1459.20 PER HRS | 22628 | 96 | 60.80 PER HRS | 978 | 4 |
| 2290 | GEN GROUNDS MAINT | 400.0 | ACRES | 400.00 PER HRS | 4554 | 300.00 PER HRS | 3416 | 75 | 100.00 PER HRS | 1138 | 25 |
| 3190 | GEN DRAINAGE MAINT | 1.0 | EA | 200.00 PER HR | 2582 | 200.00 PER HR | 2582 | 100 | 0.00 PER HR | 0 | 0 |
| 5120 | REPAIR SIGNS | 300.0 | EA | 90.00 signs | 5179 | 75.00 signs | 4316 | 83 | 15.00 signs | 863 | 17 |
| 5190 | GEN TRAFFIC SRVC MN | 1.0 | EA | 150.00 PER HRS | 1933 | 125.00 PER HRS | 1624 | 83 | 25.00 PER HRS | 309 | 17 |
| 6290 | GEN SNOW/ICE CONTRO | 1.0 | EA | 150.00 PER HRS | 2837 | 150.00 PER HRS | 2837 | 100 | 0.00 PER HRS | 0 | 0 |
| 7110 | HAUL TRASH/GARBAGE | 2.0 | EA | 400.00 TRUCK LD | 35804 | 300.00 TRUCK LD | 26860 | 75 | 100.00 TRUCK LD | 8944 | 25 |
| 7120 | MAINTAIN LANDFILL | 40.0 | ACRE | 240.00 PER HRS | 11443 | 240.00 PER HRS | 11443 | 100 | 0.00 PER HRS | 0 | 0 |
| 9100 | SUPERVISION | 1.0 | EA | 1500.00 PER HR | 24780 | 1500.00 PER HR | 24780 | 100 | 0.00 PER HR | 0 | 0 |
| 9200 | ADMIN/LV/TRNG | 1.0 | EA | 4000.00 PER HR | 45571 | 4000.00 PER HR | 45571 | 100 | 0.00 PER HR | 0 | 0 |
| | | | | TOTALS: | 438790 | | 344122 | 78 | | 94668 | 21 |

Figure 11. Example Deferred Budget for Sierra Army Depot

c. Desired program. The annual work quantity and total cost based on the desired service level.

d. Planned program. The annual work quantity and total cost based on the planned service level.

e. PCT. This is the ratio of the planned to desired work plan and indicates what percent of the desired service level is being planned. A 100 signifies that they are the same. A number less than 100 indicates a lower level of service was planned than was desired.

f. Deferred maintenance. The difference between the desired and planned programs in work quantity and cost. Usually, the planned program will be less than the desired. However, in cases where the planned values are greater than desired, the deferred maintenance values will be shown as negatives.

g. PCT. The percent of the desired program that is not included in the planned program.

h. Totals. Three total cost values are provided. These represent the sum of all costs for desired, planned and deferred programs. Percent values are calculated and shown for planned and deferred costs.

Work organizing

75. Workload distribution. The planned annual work program is distributed among the months that the work typically is performed. An example workload distribution report for Sierra is shown in Figure 12. Total person days by months are distributed for each work activity.

76. Work calendar. The work calendar shows the planned maintenance on a monthly basis for standard crew days. Figure 13 illustrates the work calendar for Sierra. This report serves as a guide to the supervisor for when specific work should be scheduled.

77. Resource requirements. Labor, equipment and material resource requirements are summarized by each resource classification used in the planning process. Monthly requirements are compiled and compared to available resources. These reports assist in decisions regarding staffing, equipment needs and materials procurement. The labor requirements report can be very helpful in determining the needs for temporary personnel, contract assistance, or overtime work to accomplish peak or seasonal workloads. Figure 14 shows the labor summary report developed for Sierra. The following items describe the information shown in this report.

a. Labor resource. The code and name of the labor classification.

b. Inventory. The number of these labor types assigned to the management unit.

DeLEUW, CATHER & Co. WORKLOAD DISTRIBUTION Page: 1
Work Management System Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

| ACTIVITY CODE | NAME | PERSON DAYS PER MONTH OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | TOTAL | CR SZ | CREW DAYS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT | 3.9 | 4.2 | 3.9 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 49.8 | 3 | 16.6 |
| 1395 | GEN CONC PVT RPR | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.0 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 24.8 | 2 | 12.4 |
| 1510 | BLADE UNPVD SURFCS | 10.5 | 10.5 | 9.0 | 9.0 | 9.5 | 9.0 | 12.0 | 12.0 | 12.0 | 10.5 | 10.5 | 10.5 | 125.0 | 2 | 83.3 |
| 1520 | STAB UNPVD SRFC | 4.4 | 4.4 | 4.4 | 4.4 | 4.0 | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 | 2.8 | 2.8 | 45.2 | 4 | 11.3 |
| 1540 | DUST CONTROL | 1.4 | 1.4 | 1.2 | 1.4 | 1.4 | 1.4 | 1.3 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 15.0 | 1 | 15.0 |
| 1730 | BLADE UNPVD SHLDRS | 8.3 | 8.3 | 8.3 | 8.6 | 8.6 | 8.6 | 8.3 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 100.0 | 1 | 100.0 |
| 1820 | MAINT RR SWITCH | 6.0 | 6.0 | 6.0 | 6.0 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.2 | 5.2 | 5.2 | 66.6 | 2 | 33.3 |
| 1830 | REPAIR RR TRACK | 8.4 | 8.4 | 8.0 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.0 | 7.8 | 99.4 | 2 | 49.7 |
| 2110 | ROADWAY SWEEPING | 5.6 | 5.6 | 5.6 | 5.7 | 5.7 | 5.7 | 5.7 | 5.1 | 5.1 | 5.1 | 5.1 | 5.1 | 65.1 | 2 | 43.3 |
| 2120 | RUNWAY SWEEPING | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 15.0 | 1 | 15.0 |
| 2140 | MACHINE MOWING | 9.0 | | | | | 10.7 | 12.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 106.7 | 1 | 106.7 |
| 2150 | HAND MOWING TRIMMING | 4.0 | 4.0 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 50.0 | 2 | 25.0 |
| 2151 | LAWN MOWING | 32.0 | | | | | 32.0 | 40.0 | 40.0 | 36.0 | 36.0 | 36.0 | 36.0 | 288.0 | 2 | 144.0 |
| 2160 | SPRAYING/WEED CONTRL | 3.0 | | | | | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 30.0 | 1 | 30.0 |
| 2210 | REPAIR FENCES | 3.9 | 3.9 | 3.0 | 2.7 | 2.7 | 2.4 | 2.4 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 30.0 | 3 | 10.0 |
| 2230 | REMOVE RDWY DEBRIS | 12.6 | 12.6 | 12.6 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 145.8 | 3 | 48.6 |
| 2290 | GEN GROUNDS MAINT | 2.6 | 2.6 | 2.4 | 2.6 | 2.6 | 2.6 | 2.6 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 30.0 | 2 | 15.0 |
| 3190 | GEN DRAINAGE MAINT | 1.8 | 1.8 | 1.8 | 1.8 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 20.0 | 2 | 10.0 |
| 5120 | REPAIR SIGNS | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 4.0 | 4.0 | 2.0 | 2.0 | 2.0 | 30.0 | 2 | 15.0 |
| 5190 | GEN TRAFFIC SRVC MNT | 1.2 | 1.2 | 1.2 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.6 | 2 | 6.3 |
| 6290 | GEN SNOW/ICE CONTROL | | | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | | | | | | 15.0 | 3 | 5.0 |
| 7110 | HAUL TRASH/GARBAGE | 8.3 | 8.3 | 8.3 | 8.5 | 8.5 | 8.5 | 8.4 | 8.3 | 8.3 | 8.2 | 8.2 | 8.2 | 100.0 | 1 | 100.0 |
| 7120 | MAINTAIN LANDFILL | 2.0 | 2.0 | 2.0 | 2.1 | 2.1 | 2.1 | 2.1 | 2.0 | 1.9 | 1.9 | 1.9 | 1.9 | 24.0 | 1 | 24.0 |
| 9100 | SUPERVISION | 12.5 | 12.5 | 12.5 | 12.6 | 12.7 | 12.6 | 12.6 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 150.0 | 1 | 150.0 |
| 9200 | ADMIN/LV/TRNG | 33.6 | 33.6 | 33.6 | 34.8 | 33.6 | 33.6 | 33.6 | 33.6 | 32.4 | 32.4 | 32.4 | 32.4 | 399.6 | 12 | 33.3 |

Figure 12. Example Workload Distribution for Sierra Army Depot

| ACTIVITY CODE | NAME/ANNUAL WORK QTY | CR SZ | CREW DAYS - PLANNED OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | ANNUAL TOTAL | AVG DAILY PRODUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT<br>499 PER HR | 3 | 1.3 | 1.4 | 1.3 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 16.6 | 30.0 |
| 1395 | GEN CONC PVT RPR<br>248 PER HRS | 2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.0 | .9 | .9 | .9 | .9 | .9 | .9 | 12.4 | 20.0 |
| 1510 | BLADE UNPVD SURFCS<br>750 ROAD MI | 2 | 7.0 | 7.0 | 6.0 | 6.0 | 6.3 | 6.0 | 8.0 | 8.0 | 8.0 | 7.0 | 7.0 | 7.0 | 83.3 | 9.0 |
| 1520 | STAB UNPVD SRFC<br>45 ROAD MI | 4 | 1.1 | 1.1 | 1.1 | 1.1 | 1.0 | .9 | .9 | .9 | .9 | .9 | .7 | .7 | 11.3 | 4.0 |
| 1540 | DUST CONTROL<br>90 ROAD MI | 1 | 1.4 | 1.4 | 1.2 | 1.4 | 1.4 | 1.4 | 1.3 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 15.0 | 6.0 |
| 1730 | BLADE UNPVD SHLDRS<br>2000 SHLDR MI | 1 | 8.3 | 8.3 | 8.3 | 8.6 | 8.6 | 8.6 | 8.3 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 100.0 | 20.0 |
| 1820 | MAINT RR SWITCH<br>100 SWITCH | 2 | 3.0 | 3.0 | 3.0 | 3.0 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.6 | 2.6 | 2.6 | 33.3 | 3.0 |
| 1830 | REPAIR RR TRACK<br>25 MILE | 2 | 4.2 | 4.2 | 4.0 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.0 | 3.9 | 49.7 | .5 |
| 2110 | ROADWAY SWEEPING<br>520 ROAD MI | 2 | 3.7 | 3.7 | 3.7 | 3.8 | 3.8 | 3.8 | 3.8 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 43.3 | 12.0 |
| 2120 | RUNWAY SWEEPING<br>2250 K SQ YD | 1 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 15.0 | 150.0 |
| 2140 | MACHINE MOWING<br>1600 ACRES | 1 | 9.0 | .0 | .0 | .0 | .0 | 10.7 | 12.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 106.7 | 15.0 |
| 2150 | HAND MOWING TRIMMING<br>500 PER HRS | 2 | 2.0 | 2.0 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 25.0 | 20.0 |
| 2151 | LAWN MOWING<br>1440 ACRES | 2 | 16.0 | .0 | .0 | .0 | .0 | 16.0 | 20.0 | 20.0 | 18.0 | 18.0 | 18.0 | 18.0 | 144.0 | 10.0 |
| 2160 | SPRAYING/WEED CONTRL<br>300 PER HRS | 1 | 3.0 | .0 | .0 | .0 | .0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 30.0 | 10.0 |
| 2210 | REPAIR FENCES<br>3000 LIN FT | 3 | 1.3 | 1.3 | 1.0 | .9 | .9 | .8 | .8 | .6 | .6 | .6 | .6 | .6 | 10.0 | 300.0 |
| 2230 | REMOVE RDWY DEBRIS<br>1459 PER HRS | 3 | 4.2 | 4.2 | 4.2 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.6 | 30.0 |
| 2290 | GEN GROUNDS MAINT<br>300 PER HRS | 2 | 1.3 | 1.3 | 1.2 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 15.0 | 20.0 |
| 3190 | GEN DRAINAGE MAINT<br>200 PER HR | 2 | .9 | .9 | .9 | .9 | .8 | .8 | .8 | .8 | .8 | .8 | .8 | .8 | 10.0 | 20.0 |
| 5120 | REPAIR SIGNS<br>75 signs | 2 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 1.0 | 1.0 | 1.0 | 15.0 | 5.0 |
| 5190 | GEN TRAFFIC SRVC MNT<br>125 PER HRS | 2 | .6 | .6 | .6 | .5 | .5 | .5 | .5 | .5 | .5 | .5 | .5 | .5 | 6.3 | 20.0 |
| 6290 | GEN SNOW/ICE CONTROL<br>150 PER HRS | 3 | .0 | .0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | .0 | .0 | .0 | .0 | .0 | 5.0 | 30.0 |
| 7110 | HAUL TRASH/GARBAGE<br>300 TRUCK LD | 1 | 8.3 | 8.3 | 8.3 | 8.5 | 8.5 | 8.5 | 8.4 | 8.3 | 8.3 | 8.2 | 8.2 | 8.2 | 100.0 | 3.0 |
| 7120 | MAINTAIN LANDFILL<br>240 PER HRS | 1 | 2.0 | 2.0 | 2.0 | 2.1 | 2.1 | 2.1 | 2.1 | 2.0 | 1.9 | 1.9 | 1.9 | 1.9 | 24.0 | 10.0 |
| 9100 | SUPERVISION<br>1500 PER HR | 1 | 12.5 | 12.5 | 12.5 | 12.6 | 12.7 | 12.6 | 12.6 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 150.0 | 10.0 |
| 9200 | ADMIN/LV/TRNG<br>4000 PER HR | 12 | 2.8 | 2.8 | 2.8 | 2.9 | 2.8 | 2.8 | 2.8 | 2.8 | 2.7 | 2.7 | 2.7 | 2.7 | 33.3 | 120.0 |

Figure 13. Example Work Calendar for Sierra Army Depot

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Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE

LABOR REQUIREMENTS REPORT (SUMMARY)

Mgmt Unit: ROAD ROADS & GROUNDS BRANCH



| RESOURCE CODE | NAME | | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | TOTAL NEED | TOTAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | PERSON DAYS BY MONTH | | | | | | | | | | | | | |
| 1110 | MNT GEN FRMN-EW | INVENTORY: | | | 1.00 | AVAILABILITY | | 100 | | | | | | | | |
| | PERSON DAYS REQUIRED: | | 15.3 | 15.3 | 15.3 | 15.5 | 15.5 | 15.4 | 15.4 | 15.2 | 15.1 | 15.1 | 15.1 | 15.1 | 183.3 | 27531 |
| | AVG NO STAFF REQUIRED: | | 1.0 | 1.0 | .9 | .9 | 1.0 | .9 | 1.0 | .8 | .9 | 1.0 | .8 | .9 | .9 | 27531 |
| 1120 | ENG EQUIP OP | INVENTORY: | | | 3.00 | AVAILABILITY | | 100 | | | | | | | | |
| | PERSON DAYS REQUIRED: | | 45.4 | 45.5 | 45.4 | 46.3 | 46.1 | 45.6 | 47.2 | 45.5 | 45.1 | 44.0 | 43.6 | 43.6 | 543.3 | 80734 |
| | AVG NO STAFF REQUIRED: | | 2.8 | 2.8 | 2.7 | 2.6 | 3.1 | 2.5 | 3.0 | 2.5 | 2.7 | 2.9 | 2.3 | 2.7 | 2.7 | 80734 |
| 1130 | MOT VEH OP | INVENTORY: | | | 3.00 | AVAILABILITY | | 100 | | | | | | | | |
| | PERSON DAYS REQUIRED: | | 42.4 | 30.5 | 30.3 | 30.7 | 30.2 | 43.3 | 47.3 | 48.6 | 48.3 | 46.8 | 46.4 | 46.4 | 491.3 | 52088 |
| | AVG NO STAFF REQUIRED: | | 2.7 | 1.9 | 1.8 | 1.7 | 2.0 | 2.4 | 3.0 | 2.7 | 2.8 | 3.1 | 2.4 | 2.9 | 2.4 | 52088 |
| 1140 | LABORER | INVENTORY: | | | 3.00 | AVAILABILITY | | 100 | | | | | | | | |
| | PERSON DAYS REQUIRED: | | 57.5 | 25.6 | 26.0 | 26.0 | 25.6 | 57.2 | 66.1 | 64.6 | 60.3 | 59.3 | 59.3 | 59.3 | 530.8 | 50875 |
| | AVG NO STAFF REQUIRED: | | 3.6 | 1.6 | 1.5 | 1.4 | 1.7 | 3.2 | 4.1 | 3.6 | 3.5 | 4.0 | 3.1 | 3.7 | 2.9 | 50875 |
| 1170 | RR MNT OP | INVENTORY: | | | 2.00 | AVAILABILITY | | 100 | | | | | | | | |
| | PERSON DAYS REQUIRED: | | 20.0 | 20.0 | 19.6 | 20.2 | 19.4 | 19.4 | 19.4 | 19.4 | 19.2 | 19.0 | 18.6 | 18.4 | 232.6 | 22608 |
| | AVG NO STAFF REQUIRED: | | 1.3 | 1.3 | 1.2 | 1.1 | 1.3 | 1.1 | 1.2 | 1.1 | 1.1 | 1.3 | 1.0 | 1.2 | 1.1 | 22608 |

Figure 14. Example Labor Requirements Reports for Sierra Army Depot

c. Availability. The estimated percent of time that the labor resource is available for work.

d. Person days by month and total. The sum of all person days required for those activities specifying this labor type.

e. Total cost. The estimated annual cost of this labor class, derived by multiplying the days required by the respective hourly rates.

f. Average number staff required. Represents the average number of persons required in this labor class for each month and an annual average. It is derived by dividing the person days required by the average person days per person per month and the availability percent.

Similar reports are available for equipment and material resources.

Work controlling

78. The last component of the complete maintenance management system consists of reporting work accomplishment and evaluating the actual and planned work accomplishment and costs. Work reports completed by field personnel record work accomplished and related use of labor, equipment and materials. These data are entered into the computerized work data files. Various evaluation and performance reports are available for maintenance managers and field supervisors to use in analyzing and evaluating the progress toward the planned work programs. These reports present key information concerning work accomplishments, costs and resource use. Two of the work evaluation reports were prepared for the demonstration data at Sierra Army Depot. These were the Performance Report and the Location Maintenance Report.

79. Performance report. A comparison of planned and actual work performance is provided for five key elements of each work activity -- person days, work accomplishment, average daily production, total cost. Figure 15 illustrates the format and content of this report.

80. Location maintenance report. Routine maintenance work for pavements is not planned by individual route or road section, but by an overall organizational unit. However, actual costs and work performed by unique road section or locations are often required by management for other purposes. The pavement location used by PAVER to assess pavement conditions were input into the sample data used to demonstrate MMS application at Sierra. Figure 16 is an example of a location maintenance report using these data.

Identify maintenance repairs

81. Identified maintenance repairs are primarily cyclic-type maintenance, such as overlays, seal coating and surface replacement. However, other

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SIERRA ARMY DEPOT PAVEMENT MAINTENANCE

PERFORMANCE REPORT
Period from 10/01/87 TO 04/30/88
Mgmt Unit: ROAD ROADS & GROUNDS BRANCH


Date: 09/19/88

| CODE | ACTIVITY NAME | PERFORMANCE INDICATOR | CURRENT MONTH PERFORMANCE PLAN | ACTUAL | PCT | YEAR TO DATE PERFORMANCE PLAN | ACTUAL | PCT |
|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT PER HR | Person Days | 4 | 12 | 300 | 29 | 28 | 97 |
| | | Accomplishment | 42.0 | 120.0 | 286 | 288.0 | 280.0 | 97 |
| | | Avg Daily Prod | 30.0 | 30.0 | 100 | 30.0 | 30.0 | 100 |
| | | Total Cost | 778 | 2223 | 286 | 5335 | 5335 | 100 |
| | | Unit Cost ($) | 18.52 | 18.53 | 100 | 18.52 | 19.05 | 103 |
| 1395 | GEN CONC PVT RPR PER HRS | Person Days | 2 | 16 | 800 | 16 | 16 | 100 |
| | | Accomplishment | 18.0 | 160.0 | 889 | 158.0 | 160.0 | 101 |
| | | Avg Daily Prod | 20.0 | 20.0 | 100 | 20.0 | 20.0 | 100 |
| | | Total Cost | 750 | 4672 | 623 | 6579 | 4672 | 71 |
| | | Unit Cost ($) | 41.67 | 29.20 | 70 | 41.64 | 29.20 | 70 |
| 1510 | BLADE UNPVD SURFCS ROAD MI | Person Days | 12 | 6 | 50 | 69 | 24 | 35 |
| | | Accomplishment | 72.0 | 35.0 | 49 | 416.7 | 145.0 | 35 |
| | | Avg Daily Prod | 9.0 | 8.8 | 98 | 9.0 | 9.1 | 101 |
| | | Total Cost | 2855 | 1481 | 52 | 16520 | 5443 | 33 |
| | | Unit Cost ($) | 39.65 | 42.31 | 107 | 39.64 | 37.54 | 95 |
| 1520 | STAB UNPVD SRFC ROAD MI | Person Days | 4 | 0 | 0 | 29 | 0 | 0 |
| | | Accomplishment | 3.6 | .0 | 0 | 28.8 | .0 | 0 |
| | | Avg Daily Prod | 4.0 | .0 | 0 | 4.0 | .0 | 0 |
| | | Total Cost | 1037 | 0 | 0 | 8296 | 0 | 0 |
| | | Unit Cost ($) | 288.06 | .00 | 0 | 288.06 | .00 | 0 |
| 1540 | DUST CONTROL ROAD MI | Person Days | 1 | 0 | 0 | 10 | 0 | 0 |
| | | Accomplishment | 7.8 | .0 | 0 | 57.0 | .0 | 0 |
| | | Avg Daily Prod | 6.0 | .0 | 0 | 6.0 | .0 | 0 |
| | | Total Cost | 387 | 0 | 0 | 2827 | 0 | 0 |
| | | Unit Cost ($) | 49.62 | .00 | 0 | 49.60 | .00 | 0 |
| 1730 | BLADE UNPVD SHLDRS SHLDR MI | Person Days | 8 | 4 | 50 | 59 | 14 | 24 |
| | | Accomplishment | 166.0 | 70.0 | 42 | 1180.0 | 225.0 | 19 |
| | | Avg Daily Prod | 20.0 | 17.5 | 88 | 20.0 | 16.1 | 81 |
| | | Total Cost | 2233 | 1076 | 48 | 15877 | 3767 | 24 |
| | | Unit Cost ($) | 13.45 | 15.37 | 114 | 13.46 | 16.74 | 124 |
| 1820 | MAINT RR SWITCH SWITCH | Person Days | 5 | 0 | 0 | 40 | 0 | 0 |
| | | Accomplishment | 8.1 | .0 | 0 | 60.3 | .0 | 0 |
| | | Avg Daily Prod | 3.0 | .0 | 0 | 3.0 | .0 | 0 |
| | | Total Cost | 647 | 0 | 0 | 4812 | 0 | 0 |
| | | Unit Cost ($) | 79.88 | .00 | 0 | 79.80 | .00 | 0 |
| 1830 | REPAIR RR TRACK MILE | Person Days | 8 | 0 | 0 | 58 | 0 | 0 |
| | | Accomplishment | 2.1 | .0 | 0 | 14.6 | .0 | 0 |
| | | Avg Daily Prod | .5 | .0 | 0 | .5 | .0 | 0 |
| | | Total Cost | 963 | 0 | 0 | 6698 | 0 | 0 |
| | | Unit Cost ($) | 458.57 | .00 | 0 | 458.77 | .00 | 0 |

Figure 15. Example Performance Report

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Work Management System
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE

LOCATION PERFORMANCE REPORT
Period from 10/01/87 TO 09/30/88
Activity: ALL

Page: 1
Date: 09/08/88

| LOCATION/TYPE/ACTIVITY CODE | NAMES | | | MONTH ACCOMPLISHMENT QTY | UNIT | COST | YEAR TO DATE ACCOMPLISHMENT QTY | UNIT | COST | COST FROM DATE OF FIRST ENTRY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT | | | | | | | | | |
| A001P | A STREET PARKING | P | | 0 | PER HR | 0 | 240 | PER HR | 4446 | 4446 |
| A018P | HEADQUARTERS PARKING | P | | 0 | PER HR | 0 | 40 | PER HR | 888 | 888 |
| | | | TOTALS: | 0 | | 0 | 280 | | 5334 | 5334 |
| 1395 | GEN CONC PVT RPR | | | | | | | | | |
| A046 | BLDG P-130 APRON | A | | 0 | PER HRS | 0 | 160 | PER HRS | 4672 | 4672 |
| | | | TOTALS: | 0 | | 0 | 160 | | 4672 | 4672 |
| 1510 | BLADE UNPVD SURFCS | | | | | | | | | |
| A096 | EQUESTRIAN STABLE ROAD | I | | 0 | ROAD MI | 0 | 70 | ROAD MI | 2962 | 2963 |
| A104 | RESERVOIR ACCESS ROAD | I | | 0 | ROAD MI | 0 | 75 | ROAD MI | 2480 | 2480 |
| | | | TOTALS: | 0 | | 0 | 145 | | 5442 | 5443 |
| 1730 | BLADE UNPVD SHLDRS | | | | | | | | | |
| A005I | CALIFORNIA AVE. | I | | 0 | SHLDR MI | 0 | 225 | SHLDR MI | 3767 | 3767 |
| | | | TOTALS: | 0 | | 0 | 225 | | 3767 | 3767 |
| 2110 | ROADWAY SWEEPING | | | | | | | | | |
| A005I | CALIFORNIA AVE. | I | | 0 | ROAD MI | 0 | 60 | ROAD MI | 1078 | 1078 |
| | | | TOTALS: | 0 | | 0 | 60 | | 1078 | 1078 |
| 2140 | MACHINE MOWING | | | | | | | | | |
| A096 | EQUESTRIAN STABLE ROAD | I | | 0 | ACRES | 0 | 260 | ACRES | 2016 | 2016 |
| | | | TOTALS: | 0 | | 0 | 260 | | 2016 | 2016 |
| 6290 | GEN SNOW/ICE CONTROL | | | | | | | | | |
| DEPOT | ANY OTHER UNASSIGNED LOC | Z | | 0 | PER HRS | 0 | 590 | PER HRS | 11286 | 11286 |
| | | | TOTALS: | 0 | | 0 | 590 | | 11286 | 11286 |
| 9100 | SUPERVISION | | | | | | | | | |
| DEPOT | ANY OTHER UNASSIGNED LOC | Z | | 0 | PER HR | 0 | 590 | PER HR | 9746 | 9747 |
| | | | TOTALS: | 0 | | 0 | 590 | | 9746 | 9747 |

Figure 16. Example Location Maintenance Report

identified repairs include crack filling, patching, grinding, grooving, joint filling and other repairs usually considered routine maintenance.

82. The type of routine maintenance repairs identified by PAVER are included as maintenance activities in maintenance management systems for work planning, organizing, directing and controlling. Maintenance management does not include an automated assessment of pavement condition to identify maintenance needs, but inputs these requirements as service levels, or quantity standards, which are developed from external sources. Routine maintenance repairs identified from PAVER are a logical input into the annual work planning component of a maintenance management system.

Maintenance feature condition

83. The condition of maintenance features to be maintained is used to determine where and how much work is needed to maintain the features at a level consistent with policies and priorities of the agency. Because planned maintenance often depends on the condition of a specific feature, an up-to-date condition assessment is necessary. This assessment of feature conditions provides the basis for preparing a maintenance work program that reflects the actual conditions of the features to be maintained.

84. Army installations with implemented PAVER systems have a complete inventory and condition assessment of pavement surfaces. This information is on a section-by-section basis and is updated periodically. The PAVER condition data can be used very effectively to develop planned service levels for pavement surface activities.

## Contract Maintenance

Management responsibility

85. Pavement maintenance by contract relieves the governmental agency of some of the management responsibility associated with the actual performance of the work and mobilization of the necessary resources. Responsibility for organizing and directing the labor forces is assigned to the contractor. The agency retains responsibility for planning the maintenance and controlling work quality. Some directing and scheduling responsibility also remains with the agency. Figure 17 shows the respective management responsibilities for maintenance by contract and maintenance by governmental agency forces.

| MANAGEMENT/SUPERVISION FUNCTIONS | RESPONSIBILITY: MAINTENANCE BY INSTALLATION FORCES | RESPONSIBILITY: MAINTENANCE BY CONTRACTORS |
|---|---|---|
| 1. Planning, Programming and Budgeting | Government | Government |
| 2. Organizing | | |
| • Contract Bids and Documents | Not Applicable | Government |
| • Equipment | Government | Contractor |
| • Material | Government | Contractor |
| • Work Force | Government | Contractor |
| • Payment for Resources | Government | Contractor |
| 3. Scheduling/Directing | | |
| • Maintenance Needs | Government | Government/Contractor |
| • Crew Mobilization | Government | Contractor |
| • Scheduling | Government | Contractor/Government |
| • Work Assignment | Government | Contractor |
| • Supervision | Government | Contractor |
| 4. Controlling | | |
| • Execution of the Work | Government | Contractor |
| • Verification of Work Quantity | Government | Government |
| • Verification of Work Quality | Government | Government |
| • Payment for Work | Not Applicable | Government |
| • Productivity | Government | Contractor |
| • Updating Planning Values | Government | Government |

Figure 17. A Comparison of Management/Supervision Functions for In-House and Contracted Maintenance Work

86. Effective maintenance planning and work control are vital to a successful contract maintenance or commercial activity process. Successful contracting must begin with adequate planning and be supported by managers experienced in contract maintenance control. Management control involves the types and quantities of work scheduled and performed, as well as the quality of work performed. Work control must be linked to the field work for successful contract management.

Planning and control

87. Maintenance management systems offer work planning and control components for managing routine day-to-day maintenance. Planned work is based on features of the physical assets to be maintained and the level of service, or work quantity, to be provided for the assets. Work quantities can be incorporated into the Request for Bid to private contractors. Comparable bids for designated quantities of work would be obtained from private contractors as well as in-house staff.

88. Work control consists of monitoring the progress of maintenance performed in comparison to the planned work, or the maintenance contract for private contractors. Work performance and cost reports are provided for assessing and controlling maintenance work efforts.

## PART VI: FINDINGS AND RECOMMENDATIONS

### Findings

Existing information systems

89. The US Army has developed several automated information systems to provide assistance to DEH's in planning and controlling construction and maintenance work on facilities and physical features. The Integrated Facilities Systems (IFS) is one of the most comprehensive automated information and evaluation systems developed. IFS has been implemented at several installations throughout the commands during the past 10 years. IFS has been revised, expanded and improved during this period and is currently being adapted to function on micro/minicomputer hardware (IFS-M). This will provide a more user-friendly, better integrated and more flexible environment to serve the operational and information needs of the individual installations.

90. An objective of IFS-M is to establish a standardized "core" facilities engineering data base that provides the minimum data set to support DEH management and reporting requirements. Existing systems to be integrated with IFS-M include:

a. Facilities Engineering Job Estimating (FEJE).

b. Facilities Engineering Supply System (FESS).

c. Job Order Contracting System (JOC).

A long-range plan is to also interface PAVER with IFS-M. The intent of IFS-M is to support a broader and higher level of maintenance planning and control through the standardized "core" da base. It is not intended to satisfy the more detailed planning and controlling requirements of first-line supervisors. These types or requirements are often unique to each installation and require a level of detail not intended for IFS-M. Consequently, predictive maintenance models such as PAVER, RAILER and ROOFER are being introduced.

Routine in-house maintenance

91. Components of IFS-M, PAVER and other support systems used by DEH do not encompass the routine day-to-day maintenance requirements for pavements. Frequently, individual job orders do not reflect resource requirements to accomplish the work. Short-term or job evaluation reports comparing inconsistent resource estimates with actual resource usage often have little meaning to field supervisory maintenance personnel.

92. The absence of an annual work program for routine pavement maintenance precludes having evaluation reports which indicate longer-term cumulative progress toward annual work objectives.

Contract maintenance

93. The absence of structured, organized quantitative information for routine pavement (and other) maintenance also impacts contracting such activities. The scopes of selected current contracts were reviewed. The scope mixed inventory, some quantitative frequency and qualitative considerations for routine maintenance activities. Annual work and resource estimates were not systematically included. Consequently, the contractor and the installation staff are faced with significant uncertainty with regard to work and required resources.

## Recommendations

94. The planning guidelines developed as a result of this project characterize routine pavement maintenance activities as whole jobs of work having a single measurable output performed by a crew functioning as a team according to a specified work procedure or method. This total or holistic approach to defining the activities best reflects what actually takes place in the field.

95. It is recommended that these guidelines be used as a basis for estimating resource requirements for individual routine pavement maintenance jobs. In practice, this estimating technique is simple, efficient and provides sufficient accuracy for management control.

96. It is also recommended that the planning guidelines be issued to first-line supervisors as a guide to mobilizing crews to perform the work. This should improve efficiency in daily crew mobilization, as well as, the setting of short-term schedules.

Application of maintenance management in-house

97. The principles of maintenance management are directly applicable to the US Army pavement systems. Maintenance items, work activities and planning guidelines were identified and developed for routine pavement maintenance during Phase 1. To further demonstrate their management utility for an army installation, these planning guidelines and other planning values were applied

to the pavement system of the Sierra Army Depot to establish an annual work program and performance budget.

98. Based on information from the six installations visited and existing information systems supporting routine maintenance, there is potential for improved work management procedures for routine and cyclic pavement maintenance which cover the full management cycle of planning, organizing, directing and controlling, particularly in support of the first-line supervisor.

99. Army installations with implemented PAVER systems have a complete inventory and condition assessment of pavement surfaces. The PAVER condition data can be used to develop planned work for pavement surface activities. Routine maintenance repairs identified from PAVER can also be used to estimate annual work quantities for selected activities and supplemented with results of this project.

100. In light of the above, it is recommended that a full-cycle routine pavement maintenance management system covering planning through controlling be developed and implemented at a minimum of two pilot test installations. The system should be characterized by the following:

a. Emphasis on information support for first-line supervisors.

b. Focus on work and work quantification.

c. Capacity to readily link annual work programs to resource estimates.

d. Utilization of inventory and work estimates from PAVER for those activities covered by PAVER.

e. Capability to report routine history by pavement section to PAVER.

f. State-of-the-art microcomputer operation sufficiently generic to accept nonpavement routine maintenance activities in the future.

Such system would be consistent with the new operating environment planned for IFS-M. It would focus on efficiencies at the level where the work is performed and information support for first-line supervisors. Routine maintenance is primarily a decentralized activity. The opportunity for efficiencies occur at the working level. The same system should also be capable of supporting contract maintenance.

Contract maintenance

101. Maintenance management systems are applicable to maintenance performed by in-house personnel, by private contractor or both. The workload

planning component can be used to quantify the maintenance workload included in commercial activities as well.

102. It is recommended that programs (scopes) for routine maintenance contracts (initially for the pavement portions) include:

a. Annual estimates of work by month by activity.

b. Annual resource estimates by type by month.

The objective would not be to absolutely tie the contractors' hands, but to quantify the maintenance, thereby reducing the uncertainty associated with these types of maintenance operations. The quantification of scope and resources and distribution throughout the year (identifying peaks and valleys) should result in both lower bids and higher profits for contractors through improved resource utilization.

103. It is recommended that the same full-cycle management system support contract maintenance. The management functions supported under contracting are indicated in Figure 17. Although less overall management functions are required under contracting, certain functions should remain exclusively with the installation staff and others performed jointly to keep the contractor on tract. The demonstration at the Sierra Army Depot is indicative of the kind of planning that is equally applicable to contract maintenance.

# BIBLIOGRAPHY

American Public Works Association. 1985. "Street and Highway Maintenance Manual," Chicago, IL.

Departments of the Army, the Navy, and the Air Force. 1984. "Engineered Performance Standards for Real Property Maintenance Activities, Roads, Grounds, Pest Control and Refuse Collection Handbook," TB 420-22/ NAVFAC P-712.0/AFM 88-51, Washington, DC.

Department of the Interior, National Park Service. 1987. "Maintenance Management, Operations Manual," Part 1 and 2, Washington, DC.

Headquarters, Department of the Army. 1972. "Engineered Performance Standards, Public Works Maintenance, General Handbook," TB 420-2/NAVDOCKS P-701.0, Washington, DC.

Headquarters, Department of the Army. 1978. "Facilities Engineering Resources Management System," Department of the Army Pamphlet 420-4, Washington, DC.

Hillsborough County, Road and Bridge Department. 1983. "Maintenance Management System, Field Operations Manual," Tampa, FL.

Iowa Department of Transportation, Highway Division. 1984. "Standards for Maintenance Activities, Ames, IA.

Joint Departments of the Army, the Navy and the Air Force, USA. "Maintenance and Repair of Surface Areas," Technical Manual TM 5-624/NAVFAC MO-102/ AFM 85, Washington, DC.

Tennessee Department of Highways, Maintenance Division. 1971. "Maintenance Field Operations Manual," Nashville, TN.

US Department of Transportation, Federal Highway Administration. 1985. "Roads and Streets Maintenance Management System," Washington, DC.

# APPENDIX A: MAINTENANCE WORK ACTIVITY DEFINITIONS

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System

## BITUMINOUS PAVEMENT

1110 Pothole Patching

Patching small areas (25 sq. ft. or less) of bituminous surfaces with asphalt concrete material to correct abrupt depressions, potholes, edge failures and other potential surface hazards to provide a smooth paved surface.

| | |
|---|---|
| Work Unit: | Tons Asphalt Concrete |
| Inventory Unit: | Bituminous Lane Mile |

1120 Partial-Depth Patch

Removal and replacement of large areas (more than 25 sq. ft) of failed bituminous surfaces excluding the base course to provide a smooth, structurally sound pavement and to eliminate safety hazards.

| | |
|---|---|
| Work Unit: | Tons Asphalt Concrete |
| Inventory Unit: | Bituminous Lane Mile |

1130 Full-Depth Patch

Removal and replacement of large areas (more than 25 sq. ft.) of failed bituminous surfaces and base courses to provide a smooth, structurally sound pavement surface and to eliminate safety hazards.

| | |
|---|---|
| Work Unit: | Tons Material |
| Inventory Unit: | Bituminous Lane Mile |

1140 Surface Treatment Patch

Patching small areas (25 sq. ft. or less) of bituminous surfaces with one or more applications of hot liquid asphalt and aggregate to correct extensive cracking, raveling, spalling and shallow surface failures to restore surface and prevent further deterioration.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Bituminous Lane Mile |

1150 Surface Treatment

Placement of surface treatments on sound bituminous surfaces to seal cracks, correct minor surface depressions and to provide a new wearing surface.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Bituminous Lane Mile |

1160 Skid Resistance Treatment

Placement of porous friction surface materials on bituminous surface to increase skid resistance and reduce hydroplaning on pavement surfaces.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Bituminous Lane Mile |

1170 Crack Sealing

Placement of crack sealant into cracks on bituminous surfaces to prevent water entry and related damage to the surfacing and base materials.

| | |
|---|---|
| Work Unit: | Gallons Sealant |
| Inventory Unit: | Bituminous Lane Mile |

1180 Treat Bleeding Asphalt

Placement of hot sand or aggregate on bleeding or flushing bituminous surfaces to absorb the film of bituminous material on the surface and to restore surface friction.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Bituminous Lane Mile |

1190 Treat Fuel Spillage

Treatment of areas subjected to moderate fuel spillage with fuel resistant sealers to reduce the leaching way of the asphalt binder and subsequent raveling of the surface aggregate.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Bituminous Lane Mile |

CONCRETE PAVEMENT

1310 Bituminous Patching of PCC Surface

Bituminous patching of small (25 sq. ft. or less) portland cement concrete (PCC) surface areas that require immediate repair to correct spalled areas, abrupt depressions and other potential surface hazards to provide a smooth paved surface.

| | |
|---|---|
| Work Unit: | Tons Asphalt Concrete |
| Inventory Unit: | Concrete Lane Mile |

1320 Partial-Depth Patch of PCC Surface

Removal and replacement of large (more than 25 sq. ft.) areas of failed portland cement concrete (PCC) surfaces excluding the base course to provide a smooth, structurally sound surface and to eliminate safety hazards.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Concrete Lane Mile |

1330 Full-Depth Patch of PCC Surface

Removal and replacement of large (more than 25 sq. ft.) areas of failed portland cement concrete (PCC) surfaces and base courses as required to provide a smooth, structurally sound surface and to eliminate safety hazards.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Concrete Lane Mile |

1340 Epoxy Patching

Patching spalled areas and shallow surface defects in portland cement concrete pavements with epoxy grout, mortar and concrete materials to prevent water entry and further deterioration.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Concrete Lane Mile |

1350 Bituminous Undersealing

Injection of liquid bituminous material under portland cement concrete pavements to fill and prevent the enlarging of minor voids under the pavement surface.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Concrete Lane Mile |

1360 Crack/Joint Sealing

Placement of adhesive material into joints and cracks on portland cement concrete pavements to prevent the entry of water and foreign matter and related damage to the surfacing and base materials.

| | |
|---|---|
| Work Unit: | Linear Feet |
| Inventory Unit: | Concrete Lane Mile |

1370 Slab Replacement

Removal and replacement of entire portland cement concrete pavement slabs, including the base courses as required to provide a structurally sound surface capable of supporting the required loads.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Concrete Lane Mile |

1380 Slabjacking

Pumping of grout mixtures through holes cored in portland cement concrete pavements into void areas under the pavement to raise and realign the pavement slab by filling the void areas.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Concrete Lane Mile |

1390 Slab Grinding

Grinding of concrete portland cement pavements to level and realign faulted areas between slabs or cracks within the slab by grinding the high side.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Concrete Lane Mile |

1400 Surface Grooving

Grooving portland cement concrete pavements by cutting a series of small grooves or cuts in the pavement surface to improve the surface skid resistance.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Concrete Lane Mile |

OTHER SURFACES

1510 Blade Unpaved Surface

Blading, reshaping and smoothing unpaved surfaces, without adding material or widening, to restore crown, proper shape, drainage and smooth riding surface. Includes pulling and cleaning roadside ditches and sloping of shoulders as required.

| | |
|---|---|
| Work Unit: | Road Miles |
| Inventory Unit: | Unpaved Road Miles |

1520 Add Gravel to Unpaved Surface

Repairing and stabilizing unpaved surfaces by adding granular materials. Includes reshaping and compacting to correct ruts, potholes, washouts, corrugations and to restore crown, proper shape, drainage and a smooth riding surface.

| | |
|---|---|
| Work Unit: | Road Miles |
| Inventory Unit: | Unpaved Road Miles |

1530 Cement/Lime Stabilization

Application of cement or lime mixtures to unpaved surface materials and mixing with water. Includes reshaping and compacting to provide proper cross-section, drainage and a smooth riding surface.

Work Unit: Road Miles
Inventory Unit: Unpaved Road Miles

1540 Dust Control

Application of dust control materials on unpaved surfaces to control dust and to minimize detrimental effects on personnel, equipment and aircraft.

Work Unit: Road Miles
Inventory Unit: Unpaved Road Miles

1550 Blade Troop Trails

Blading, reshaping and smoothing unpaved troop trails to remove vegetation and restore crown. Includes adding aggregate as necessary to maintain shape and integrity of trail.

Work Unit: Trail Miles
Inventory Unit: Troop Trail Miles

SHOULDERS

1710 Patch Paved Shoulders

Patching of paved shoulders with asphalt concrete material to correct abrupt depressions, edge failures and other potential surface hazards to provide a smooth paved surface.

Work Unit: Tons Asphalt Concrete
Inventory Unit: Paved Shoulder Miles

1720 Seal Coating

Seal coating of paved shoulders with hot liquid asphalt and cover aggregate to correct extensive cracking and spalling, prevent further deterioration and to provide an impervious surface.

Work Unit: Square Yards
Inventory Unit: Paved Shoulder Miles

1730 Blade Unpaved Shoulders

Blading and reshaping unpaved or stabilized turf shoulders on paved roads to eliminate edge ruts, washouts, ridges, corrugations and high, overgrown shoulders. Includes major cutting and grading to restore proper shoulder slope for adequate drainage.

Work Unit: Shoulder Miles
Inventory Unit: Unpaved Shoulder Miles

1740 Add Gravel to Unpaved Shoulders

Repairing unpaved shoulders on paved roads by adding granular materials. Includes reshaping and compacting to correct ruts, potholes, washouts, corrugations and to restore proper shoulder slope for adequate drainage.

| | |
|---|---|
| Work Unit: | Tons Material |
| Inventory Unit: | Unpaved Shoulder Miles |

ROADSIDE

2110 Roadway Sweeping

Sweeping paved roadway surfaces, including parking areas, intersections and curb and gutter to remove dirt, sand and other debris

| | |
|---|---|
| Work Unit: | Lane Miles |
| Inventory Unit: | Paved Roadway Lane Miles |

2120 Runway Sweeping

Sweeping paved runway surfaces, including taxiways and aircraft parking aprons to remove dirt, sand and other potential hazards to aircraft and personnel.

| | |
|---|---|
| Work Unit: | Lane Miles |
| Inventory Unit: | Runway Lane Miles |

2130 Magnet Sweeping

Magnet sweeping of paved roadways and runways to remove metal debris from surface to allow safe operation of equipment and aircraft.

| | |
|---|---|
| Work Unit: | Lane Miles |
| Inventory Unit: | Paved Surface Lane Miles |

2140 Machine Mowing

Tractor mowing of roadsides and designated grounds area to maintain an attractive roadside and grounds, provide adequate sight distance and control erosion and drainage.

| | |
|---|---|
| Work Unit: | Acres |
| Inventory Unit: | Mowable Acres |

2150 Hand Mowing/Trimming

Mowing and trimming areas, such as medians, steep slopes and other areas not accessible to tractors, with walk-behind mowers and other hand tools to maintain the vegetation and to control erosion and drainage.

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Mowable Acres |

2160 Spraying/Weed Control

Application of chemicals to vegetation and soil to eliminate undesirable growth or control growth in areas inaccessible to mowers, such as around guardrails, signs, fences, bridge ends, drainage ditches and other designated areas.

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Mowable Acres |

2170 Reseeding and Sodding

Reseeding and sodding of roadsides and grounds areas to restore vegetation for erosion control and appearance.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Mowable Acres |

2180 Erosion Control

Repair of erosion and failures on slopes to restore stability and the removal and disposal of eroded material.

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Mowable Acres |

2190 Litter Pickup

Pickup and disposal of litter, trash and other debris on roadsides, parking areas and other designated areas for aesthetic value, and to remove unsightly or hazardous objects that may obstruct drainage or damage mowing equipment or personnel.

| | |
|---|---|
| Work Unit: | Bags Litter |
| Inventory Unit: | Grounds Acres |

2200 Brush/Tree Cutting

Cutting and removing brush and trees within the right-of-way and other areas to restore sight distances, eliminate traffic hazards and remove encroaching vegetation.

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Grounds Acres |

2210 Repair Fences

Straightening and repair of broken or damaged fencing around government facilities to provide safety and security.

| | |
|---|---|
| Work Unit: | Linear Feet |
| Inventory Unit: | Linear Feet Fence |

2220 Clean Grit Chambers

Cleaning and removal of dirt, gravel and other debris from grit chambers of motor pool washracks.

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Number Wash Racks |

2230 Remove Roadway Debris

Removal of roadway debris due to vehicle accidents and storm damage to provide safe use of the roadway.

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Roadway Miles |

DRAINAGE

3110 Clean/Reshape Ditches

Cleaning and reshaping of roadside ditches along paved surfaces. Includes the removal, hauling and disposal of excess material to restore the original grade line and to ensure adequate drainage.

| | |
|---|---|
| Work Unit: | Ditch Miles |
| Inventory Unit: | Unpaved Ditch Miles |

3120 Clean Culverts/Inlets

Cleaning and removal of debris and silt as required from box culverts, drain pipe culverts, inlets, and storm sewers to maintain adequate drainage and prevent flooding.

| | |
|---|---|
| Work Unit: | Number Culverts/Inlets |
| Inventory Unit: | Number Culverts/Inlets |

3130 Repair/Replace Culverts

Repair or replacement of pipe culverts, drop inlets, catch basins and manholes to provide proper drainage. Includes the repair of headwalls and sand bagging of culvert ends to prevent erosion and washouts.

| | |
|---|---|
| Work Unit: | Number Culverts/Inlets |
| Inventory Unit: | Number Culverts/Inlets |

3140 Place Riprap

Placing or replacing riprap on embankments and around bridges and drainage structures to prevent erosion and other failures.

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Unpaved Ditch Miles |

3150 Clean/Clear Canals

The machine cleaning and reshaping of canals and non-roadway drainage ditches including the removal, hauling and disposal of excess material and sludge to restore the original grade line and to ensure adequate drainage at all times.

| | |
|---|---|
| Work Unit: | Linear Feet |
| Inventory Unit: | Canal Miles |

BRIDGE SURFACE

4110 Clean Bridge Surface

Cleaning of bridge decks and bearing surfaces to remove sand and other debris, including the cleaning of expansion joints, drain holes and curbs.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Square Yards Bridge Deck |

4120 Repair Timber Deck

Repair and replacement of timber deck components to restore or preserve structural stability and smooth riding surface.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Square Yards Timber Deck |

4130 Repair Bridge Deck

Repair and patching of portland cement concrete and asphalt concrete bridge deck surfaces to maintain or restore structural stability and smooth riding surface.

| | |
|---|---|
| Work Unit: | Square Yards |
| Inventory Unit: | Square Yards Non-Timber Deck |

## TRAFFIC SERVICES

5110 Traffic Line Striping

Striping the centerline, edge and lane markings on paved surfaces for traffic, parking and pedestrian control.

| | |
|---|---|
| Work Unit: | Linear Feet |
| Inventory Unit: | *Traffic Line Miles* |

5120 Repair Signs

Repair, replacement and straightening of traffic signs, sign posts, delineators and other signs damaged by accident, vandalism, or deterioration to restore and maintain adequate control and guidance of traffic.

| | |
|---|---|
| Work Unit: | Number Signs |
| Inventory Unit: | Number Traffic Signs |

5130 Repair Guardrail

Repair of damaged or deteriorated guardrail/guiderail sections and posts to provide save driving conditions.

| | |
|---|---|
| Work Unit: | Linear Feet |
| Inventory Unit: | Linear Feet Guardrail |

5140 Repair Lights

Routine servicing, maintenance and repair of roadway lighting, tunnel or parking area lights to provide adequate lighting to high density vehicular use and parking areas.

| | |
|---|---|
| Work Unit: | Number Lights |
| Inventory Unit: | Number Lights |

5150 Repair Signals

Routine servicing, maintenance and repair of traffic signals and associated equipment to correct or prevent signal malfunction and to return signal to service.

| | |
|---|---|
| Work Unit: | Number Signals |
| Inventory Unit: | Number Signals |

## SNOW AND ICE CONTROL

6110 Plow Roadways

Plowing of snow from roadways and parking areas to provide access and reduce hazardous driving conditions.

| | |
|---|---|
| Work Unit: | Roadway Miles |
| Inventory Unit: | Roadway Miles |

6120 Plow Runways

Plowing of snow from runways, taxiways, heliports and aircraft parking aprons to provide for safe aircraft operations and to reduce hazardous operating conditions.

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Runway Lane Miles |

6130 Rotary Snow Removal

Removal of heavy snow accumulations from runways and other areas when it is required to remove the snow from the area being plowed or to load the snow into trucks for disposal.

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Paved Surface Lane Miles |

6140 Load/Haul Snow

Loading and hauling snow from windrowed snow, rotary plow operations or other areas when the snow must be hauled to a disposal site.

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Paved Surface Lane Miles |

6150 Sweep Snow from Runways

Sweeping runways to remove snow and slush from the pavement surface throughout the snowfall duration to maintain the center of the runway in a bare pavement

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Runway Lane Miles |

6160 Apply Chemicals/Abrasives for Ice Control

Application of approved chemicals and/or abrasives to runways, taxiways, roadways, parking areas and hazardous locations to remove ice and provide for safe vehicle and aircraft operations.

| | |
|---|---|
| Work Unit: | Person Hours |
| Inventory Unit: | Paved Surface Lane Miles |

6170 Clear Snow and Ice from Runway Lights

Clearing snow and ice from runway edge lights to maintain visibility and provide runway clearance for aircraft movement and safe operations.

| | |
|---|---|
| Work Unit: | Number Lights |
| Inventory Unit: | Number Runway Lights |

6180 Clear Walkways

Removal of snow and ice from sidewalks and other walkways to provide safe passage and use for personnel.

| | |
|---|---|
| Work Unit: | Linear Feet |
| Inventory Unit: | Linear Feet Sidewalk |

6190 Install/Remove Snow Fence

Installation and removal of snow fences at selected locations to minimize and reduce the effect of snowdrifts on roadways and runways.

| | |
|---|---|
| Work Unit: | Linear Feet |
| Inventory Unit: | Number Locations |

6200 Install/Remove Snow Markers

Installation and removal of snow markers to identify the location of airfield lighting systems and other potential snow plowing obstacles.

| | |
|---|---|
| Work Unit: | Number Markers |
| Inventory Unit: | Number Locations |

# APPENDIX B: PLANNING GUIDELINES

## U.S. ARMY CORPS OF ENGINEERS
## Maintenance Management System

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# PLANNING GUIDELINE

**U.S. Army**
***Engineering & Housing Support Center***
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Pothole Patching | **CODE** | 1110 |
|---|---|---|---|

**DESCRIPTION**

Patching small areas (25 sq. ft, or less) of bituminous surfaces with asphalt concrete material to correct abrupt depressions, potholes, edge failures and other potential surface hazards to provide a smooth paved surface.

**MAINTENANCE ITEM** Bituminous Surface Lane Mile

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

Perform when potholes and other hazards are identified. Schedule the work by geographical area, except for emergencies. Hot-mix asphalt concrete is the preferred patching material when available.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Vehicle Operator | 1 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Vibratory Tamper | 1 |
| Heater-Blower | 1 |
| Saw or Air Hammer | 1 |
| Straight Edge | 1 |

**MATERIAL**

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material

**DAILY PRODUCTION**

3 - 5 Tons Asphalt Concrete

## REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977. Pg. 3-37, 38, par. 3-5.6.7.1-3.

| WORK ACTIVITY | Pothole Patching | CODE | 1110 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Use truck warning lights and other traffic controls as required.
2. Mark area to be removed at least six inches beyond the damaged area.
3. Saw or jack hammer around the marked area.
4. Square the edges to provide a vertical face on the area to be patched.
5. Remove all loose debris from area to be patched.
6. Level and compact the base.
7. Make sure the area is dry. Use heater-blower if necessary.
8. Spray tack lightly on bottom and sides of area to be patched.
9. Place and rake premix in layers not exceeding 2 inches, compacting each layer with tamper.
10. Check with straight edge to make sure patch is level with surrounding surface.
11. Clean area and remove signs and safety devices.

**ENGINEERED PERFORMANCE STANDARD**

6.00000 Hours per Ton

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Partial-Depth Patch | **CODE** | 1120 |
|---|---|---|---|

**DESCRIPTION**

Removal and replacement of large areas (more than 25 sq. ft) of failed bituminous surfaces excluding the base course to provide a smooth, structurally sound pavement surface and to eliminate safety hazards.

**MAINTENANCE ITEM** Bituminous Surface Lane Mile

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

Remove all contaminated materials when patching fuel spill areas.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 2 |
| Loader/Backhoe | 1 |
| Roller and/or Tamper | 1 |
| Asphalt Kettle | 1 |
| Saw or Air Hammer | 1 |
| Straight Edge | 1 |

**MATERIAL**

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material

**DAILY PRODUCTION**

5 - 10 Tons Asphalt Concrete

## REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977

| WORK ACTIVITY | Partial-Depth Patch | CODE | 1120 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark limits of patch area - the edges of the patch should extend at least one foot into sound pavement.
3. Saw around area to be removed, or use jack hammer.
4. Remove deteriorated pavement and load into truck.
5. Compact base material as required.
6. Apply tack coat or prime to the area to be patched and around edge of existing pavement.
7. Place asphalt in layers not to exceed 2 inches.
8. Rake asphalt as required to smooth out any loose material and around corners and turnouts.
9. Compact each layer with roller and/or tamper.
10. Place and compact final layer level with the surrounding surface.
11. Roll out patched area and check with straight edge.
12. Clean area and remove signs and safety devices.

**ENGINEERED PERFORMANCE STANDARD**

5.33333 Hours per Ton

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Full-Depth Patch | CODE | 1130 |
|---|---|---|---|

**DESCRIPTION**

Removal and replacement of large areas (more than 25 sq. ft.) of failed bituminous surfaces and base courses to provide a smooth, structurally sound pavement surface and to eliminate safety hazards.

**MAINTENANCE ITEM** Bituminous Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

Perform when surface is badly alligatored or thermo cracked. Schedule the repair of identified failures by geographic area.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Vehicle Operator | 3 |
| Laborer | 3 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 3 |
| Loader/Backhoe | 1 |
| Roller and/or Tamper | 1 |
| Asphalt Kettle | 1 |
| Saw or Air Hammer | 1 |
| Straight Edge | 1 |

**MATERIAL**

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material
Base Material

**DAILY PRODUCTION**

10 - 15 Tons Material

## REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977.

| WORK ACTIVITY | Full-Depth Patch | CODE | 1130 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark limits of patch area - the edges of the patch should extent at least one foot into sound pavement.
3. Saw around area to be removed, or use jack hammer.
4. Remove deteriorated pavement and load into truck.
5. Replace base material as required and compact until even with bottom of existing pavement. (Hot mix may be used to replace base.)
6. Apply tack coat or prime to the area to be patched and around edge of existing pavement.
7. Place asphalt in layers not to exceed 2 inches.
8. Rake asphalt as required to smooth out any loose material and around corners and turnouts.
9. Compact each layer with roller and/or tamper.
10. Place and compact final layer level with the surrounding surface.
11. Roll out patched area and compact area to a smooth surface matching surrounding area.
12. Check surface with straight edge.
13. Clean area and remove signs and safety devices.

**ENGINEERED PERFORMANCE STANDARD**

4.48000 Hours per Ton

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Surface Treatment Patch | **CODE** | 1140 |
|---|---|---|---|

**DESCRIPTION**

Patching small areas (25 sq. ft or less) of bituminous surfaces with one or more applications of hot liquid asphalt and aggregate to correct extensive cracking, raveling, spalling and shallow surface failures to restore surface and prevent further deterioration.

**MAINTENANCE ITEM** Bituminous Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 3 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 2 |
| Roller, Rubber Tire | 1 |
| Asphalt Distributor | 1 |

**MATERIAL**

Liquid Asphalt
Seal Aggregate

**DAILY PRODUCTION**

200 - 400 Square Yards

## REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977. pg. 3-1, par. 3-2.2, pg. 3-34, par. 3-5.6.4.1.
3. TM 5-822-8, Bituminous Pavements Standard Practice, July 1987, pg. 2-5, par. 2-11.
4. Pavement surface should be dry.

| WORK ACTIVITY | Surface Treatment Patch | CODE | 1140 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark limits of area to be patched.
3. Broom marked area with hand broom to remove dirt and loose material.
4. Apply liquid asphalt with hand spray and stay within the marked area.
5. Spread seal aggregate in a uniform layer over the sprayed asphalt. Broom excess aggregate to provide complete coverage.
6. Roll the patched area with at least three passes.
7. Repeat steps 4, 5, and 6 until the patched area is even with the adjacent pavement. Limited to 2 applications.
8. Clean area and remove signs and safety devices.

**ENGINEERED PERFORMANCE STANDARD**

0.16000 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Surface Treatment | CODE | 1150 |
|---|---|---|---|

**DESCRIPTION**

Placement of surface treatments on sound bituminous surfaces to seal cracks, correct minor surface depressions and to provide a new wearing surface.

| MAINTENANCE ITEM | Bituminous Surface Lane Mile |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | | X | X | X | X | X |

*Placement of seal coat surfacing to seal cracks, correct minor surface depressions and to provide a new wearing surface*

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 3 |
| Vehicle Operator | 4 |
| Maintenance Worker | 2 |
| Laborer | 4 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 2 |
| Dump Truck (10CY) | 2 |
| Distributor | 1 |
| Chip Spreader | 1 |
| Power Rotary Broom | 1 |
| Roller, Rubber Tire | 2 |

**MATERIAL**

Liquid Asphalt
Seal Aggregate

**DAILY PRODUCTION**

30,000 - 45,000 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-822-8, Bituminous Pavements Standard Practice, July 1987. Pg. 2-5, par. 2-11.
2. TM 5-624, Chapter 3, Bituminous Pavement, March 1977. Pg. 3-1, Par. 3-2.2.
3. Control traffic at speeds no greater than 15 mph for 2-4 hours.

| WORK ACTIVITY | Surface Treatment | CODE | 1150 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices as required.
2. Close road/lane to traffic.
3. Sweep and clean loose debris from pavement.
4. Apply heated liquid asphalt material with properly calibrated distributor to one lane at a time.
5. Spread aggregate immediately after application of liquid asphalt with mechanical spreader.
6. Hand broom aggregates before liquid asphalt cools where necessary to ensure all bituminous material is covered.
7. Roll sealed area with rubber tire roller.
8. Remove excess stone from pavement using rotary sweeper with minimum downward pressure.
9. Clean area and remove traffic control devices.

Precautions

1. Distributor must be properly calibrated.
2. Cover stone must be correct gradation.
3. Application rates for asphalt and stone must be correct for conditions. (Adjust for emulsions and/or surface conditions)
4. Apply cover stone immediately after application of liquid asphalt. Roll with rubber tired roller.

**ENGINEERED PERFORMANCE STANDARD**

0.00299 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Skid Resistance Treatment | CODE | 1160 |
|---|---|---|---|

**DESCRIPTION**

Placement of porous friction surface materials on bituminous surface to increase skid resistance and reduce hydroplaning on pavement surfaces.

**MAINTENANCE ITEM** Bituminous Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 3 |
| Vehicle Operator | 4 |
| Maintenance Worker | 2 |
| Laborer | 4 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 2 |
| Dump Truck (10CY) | 4 |
| Distributor | 1 |
| Paver, Asphalt | 1 |
| Power Broom | 1 |
| Roller, Non-Vibratory/Steel Wheel | 2 |

**MATERIAL**

Porous Friction Asphalt
Liquid Asphalt

**DAILY PRODUCTION**

15,000 - 20,000 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-822-8, Bituminous Pavements Standard Practice, July 1987, pg. 6-22, par. 6-3.
2. NAV FAC DM-5

| WORK ACTIVITY | Skid Resistance Treatment | CODE | 1160 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices as required.
2. Close road/lane to traffic.
3. Sweep loose debris from pavement.
4. Apply tack asphalt to one lane at a time.
5. Apply hot porous friction asphalt with paving machine.
6. Begin rolling as soon as material will support roller.
7. Roll until aggregate is seated, approximately 1 or 2 passes.
8. Clean area and remove traffic control devices.

Precautions

1. Use proper mix design.
2. Aggregate must be clean.
3. Hard durable aggregates of the proper size, usually square and uniform, must be used.

**ENGINEERED PERFORMANCE STANDARD**

0.00640 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Crack Sealing | CODE | 1170 |
|---|---|---|---|

**DESCRIPTION**

Placement of crack sealant into cracks on bituminous surfaces to prevent water entry and related damage to the surfacing and base materials.

**MAINTENANCE ITEM** Bituminous Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | | | | X | X | X | | | | |

Perform annually in spring and late fall on all facilities where cracks 1/8" or wider are identified.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 2 |
| Air Compressor | 1 |
| Crack Filler/Asphalt Kettle | 1 |
| Router or Grinder | 1 |
| Sand Blaster | 1 |

**MATERIAL**

Crack Sealant
Sand

**DAILY PRODUCTION**

100 - 300 Gallons Sealant

## REFERENCES - METHODS & SAFETY

1. AFM-88-6, Chapter 7
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977. Pg. 3-27, par. 3-54, pg. 3-33, par. 3-5.6.2.

| WORK ACTIVITY | Crack Sealing | CODE | 1170 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Rout, grind or sandblast cracks.
3. Clean cracks with air compressor.
4. Seal cracks. Apply sealant to within 1/4 inch of surface.
5. Apply sand as required to prevent tracking.
6. Remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

0.16000 Hours per Gallon

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Treat Bleeding Asphalt | CODE | 1180 |
|---|---|---|---|

**DESCRIPTION**

Placement of hot sand or aggregate on bleeding or flushing bituminous surfaces to absorb the film of bituminous material on the surface and to restore surface friction.

**MAINTENANCE ITEM** Bituminous Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 2 |
| Spreader Box | 2 |
| Rubber Tire Roller | 1 |
| Power Broom | 1 |
| Front End Loader | 1 |

**MATERIAL**

Sand
Seal Aggregate

**DAILY PRODUCTION**

500 - 1,000 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 3, Bituminous Pavements, March 1977, pg. 3-40, par. 3-5.6.9.2.

| WORK ACTIVITY | Treat Bleeding Asphalt | CODE | 1180 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark limits of area to be treated.
3. Heat sand in mixing plant or by other uniform heating method.
4. Spread hot sand or aggregate on the bleeding area to blot the asphalt.
5. Roll the area immediately with a rubber-tired roller.
6. After the sand or aggregate has cooled, broom off excess material. Repeat steps 3-5 if necessary.
7. Remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

0.06400 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Treat Fuel Spillage | **CODE** | 1190 |
|---|---|---|---|

**DESCRIPTION**

Treatment of areas subjected to moderate fuel spillage with fuel resistant sealers to reduce the leaching away of the asphalt binder and subsequent raveling of the surface aggregate.

| **MAINTENANCE ITEM** | Bituminous Surface Lane Mile |
|---|---|

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

Damaged bituminous areas must be repaired before treatment. New areas and permanent repairs are made with portland cement concrete.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | **QUANTITY** |
|---|---|
| Vehicle Operator | 1 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Mixing Drum & Mixer | 1 |
| Squeegee | 1 |

**MATERIAL**

Fuel Resistant Sealer
Fine Aggregate

**DAILY PRODUCTION**

300 - 500 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 3, Bituminous Pavements, March 1977. Pg. 3-41, par. 3-5.6.12.

| WORK ACTIVITY | Treat Fuel Spillage | CODE | 1190 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Clean and sweep area.
3. Mix fuel resistant sealer according to manufacturers instructions.
4. Treat with fuel resistant sealer.
5. Clean area and remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

0.06000 Hours per Square Yard

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Bituminous Patching of PCC Surface | CODE | 1310 |
|---|---|---|---|

**DESCRIPTION**

Bituminous patching of small (25 sq. ft or less) portland cement concrete (PCC) surface areas that require immediate repair to correct spalled areas, abrupt depressions and other potential surface hazards to provide a smooth paved surface.

**MAINTENANCE ITEM** Concrete Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Vehicle Operator | 1 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Vibratory Tamper | 1 |
| Concrete Saw | 1 |
| Jack Hammer | 1 |
| Straight Edge | 1 |

**MATERIAL**

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material

**DAILY PRODUCTION**

3 - 5 Tons Asphalt Concrete

## REFERENCES - METHODS & SAFETY

1. TR-M-294, September 1980
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977 Pg 3-37, par. 3-5.6.7.1-3.
3. TM 5-624, Chapter 4 Concrete Pavements, March 1977, pg 4-51, par 4-10.6.2.
4. Dispose of removed concrete pavement at approved site.

| WORK ACTIVITY | Bituminous Patching | CODE | 1310 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Use truck warning lights and other traffic controls as required.
2. Mark area to be removed and saw or jack hammer around the area.
3. Remove all loose debris and broken concrete from area to be patched.
4. Square the edges with saw or jack hammer to provide a vertical face on the area to be patched.
5. Make sure the area is as dry as possible.
6. Spray tack lightly on bottom and sides.
7. Place and rake premix in layers not exceeding 2 inches, compacting each layer with tamper.
8. Check with straight edge to make sure patch is level with surrounding surface. Do not make a bump out of a hole.
9. Clean area and remove signs and safety devices.

**ENGINEERED PERFORMANCE STANDARD**

6.00000 Hours per Ton

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Partial-Depth Patch of PCC Surface | CODE | 1320 |
|---|---|---|---|

**DESCRIPTION**

Removal and replacement of large (more than 25 sq. ft.) areas of failed portland cement concrete (PCC) surfaces excluding the base course to provide a smooth, structurally sound surface and to eliminate safety hazards.

| MAINTENANCE ITEM | Concrete Surface Lane Mile |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

| PERSONNEL | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 2 |

| EQUIPMENT | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 2 |
| Loader/Backhoe | 1 |
| Air Compressor | 1 |
| Concrete Saw | 1 |
| Concrete Mixer | 1 |
| Jack Hammer | 1 |

**MATERIAL**

Ready Mix Concrete
Cement
Aggregate
Sand
Bonding Grout

**DAILY PRODUCTION**

25 - 35 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements, March 1977, pg. 4-47, par. 4-10.4.
2. Ready Mix concrete may be used when available.
3. High early strength PCC may be used to return pavement to service within 24 - 48 hours.

| WORK ACTIVITY | Partial-Depth Patch | CODE | 1320 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark area to be removed - at least 2 inches beyond the damaged area.
3. Saw along marked lines to a minimum depth of 2 inches.
4. Breakout the sawed area with air jack hammer to a depth of sound concrete.
5. Load the broken up concrete pavement into truck for disposal at approved site.
6. Use the air compressor to blow out dust and loose debris from the area.
7. Form joint if patch is along a joint.
8. Treat the bottom and sawed edges with a bonding grout mixture.
9. Place and vibrate or tamp the concrete mixture before the grout begins to dry.
10. Finish the concrete surface flush with the adjacent surface and broom finish to matching texture.
11. Cover with wet burlap or apply curing compound.
12. Set up traffic control devices to protect area.
13. Clean area and remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

1 60000 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Full-Depth Patch of PCC Surface | CODE | 1330 |
|---|---|---|---|

**DESCRIPTION**

Removal and replacement of large (more than 25 sq. ft.) areas of failed portland cement concrete (PCC) surfaces and base courses as required to provide a smooth, structurally sound surface and to eliminate safety hazards.

| MAINTENANCE ITEM | Concrete Surface Lane Mile |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 3 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 2 |
| Loader/Backhoe | 1 |
| Air Compressor | 1 |
| Concrete Saw | 1 |
| Concrete Mixer | 1 |
| Drill | 1 |

**MATERIAL**

| | |
|---|---|
| Cement | Ready Mix Concrete |
| Aggregate | Dowels/Reinforcing Steel |
| Sand | |
| Bonding Grout | |
| Base Aggregate | |

**DAILY PRODUCTION**

20 - 30 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements, March 1977. Pg. 4-47, par. 4-10.4.
2. Military Construction Guide Specification 02515.
3. Air-entrained concrete will be used for all patching.
4. Remove/replace only damaged base areas.

| WORK ACTIVITY | Full-Depth Patch | CODE | 1330 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark area to be removed - at least 6 inches beyond the damaged area.
3. Saw along marked area at a depth to provide for removal of full depth.
4. Breakout the sawed area with air hammer down to base material.
5. Remove the broken up concrete pavement and load into truck for disposal at approved site.
6. Remove and replace deteriorated base material if required and recompact.
7. Use the air compressor to blow out dust and loose debris from the area.
8. Form joint if patch is along a joint. Replacement joints will be doweled and built to specifications in reinforced pavements.
9. Treat the sides of the sawed areas with a bonding grout mixture.
10. Place the concrete mixture, vibrate or tamp, and screed off flush with the adjacent surface.
11. Float and finish the surface texture to match the existing pavement.
12. Cover new surface with wet burlap or apply curing compound.
13. Set up traffic control devices to protect area until concrete has cured.
14. Clean area and remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

2.24000 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Epoxy Patching | **CODE** | 1340 |
|---|---|---|---|

**DESCRIPTION**

Patching spalled areas and shallow surface defects in portland cement concrete pavements with epoxy grout, mortars and concrete materials to prevent water entry and further deterioration.

**MAINTENANCE ITEM** Concrete Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | | | | | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 1 |
| Loader/Backhoe | 1 |
| Air Compressor | 1 |
| Concrete Saw | 1 |
| Grout Mixer | 1 |

**MATERIAL**

Epoxy Mix
Sand
Aggregate

**DAILY PRODUCTION**

15 - 25 Square Yards

## REFERENCES - METHODS & SAFETY

1. ASTM C-881
2. MMM-A-001993
3. TM 5-822-9, Repair of Rigid Pavements using Epoxy Resin Grouts, Mortars and Concrete. January 1968.
4. TM 5-624, Chapter 4, Concrete Pavements, March 1977. Pg. 4-34, par. 4-7.4.

| WORK ACTIVITY | Epoxy Patching | CODE | 1340 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark area to be removed - at least 2 inches beyond the damaged area.
3. Saw along marked lines to a minimum depth of 2 inches.
4. Breakout the sawed area with air hammer to a depth of sound concrete.
5. Load the broken up concrete pavement into truck for disposal at approved site.
6. Use the air compressor to blow out dust and loose debris from the area.
7. Mix the epoxy resin, sand and aggregate in accordance with manufacturers instructions.
8. Treat the bottom and sawed edges with a the epoxy resin.
9. Place the epoxy mixture and tamp immediately before set-up begins.
10. Finish the concrete surface flush with the adjacent surface and broom finish to match existing texture.
11. Protect the patched area until mix has set firmly, usually 4 to 6 hours depending on air temperature. Curing time can be shortened by use of infrared heater.
12. Clean area and remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

2.40000 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Bituminous Undersealing | CODE | 1350 |
|---|---|---|---|

**DESCRIPTION**

Injection of liquid bituminous material under portland cement concrete pavements to fill and prevent the enlarging of minor voids under the pavement surface.

**MAINTENANCE ITEM** Concrete Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

Use of asphalt to fill voids greater than 1 inch in depth is not recommended.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 1 |
| Distributor | 1 |
| Air Compressor | 1 |
| Concrete Drill | 1 |
| Water Tank | 1 |

**MATERIAL**

Liquid Asphalt (Underseal Mixture)
Hardwood Plugs

**DAILY PRODUCTION**

80 - 120 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements, March 1977, pg. 4-43, par. 4-9.

| WORK ACTIVITY | Bituminous Undersealing | CODE | 1350 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark locations for drilling pavement.
3. Drill holes through pavement thickness at designated locations.
4. Insert air hose nozzle into holes and force all water from beneath the slab.
5. Insert asphalt hose nozzle into drilled hole and pump heated asphalt beneath the slab.
6. Remove nozzle from hole when pumping is completed and plug hole tightly with wooden plugs.
7. While pumping, spray water on adjacent pavement to prevent discoloration of the surface and to chill/harden asphalt seeping through cracks or joints.
8. Repeat steps 4-7 for remaining holes.
9. Check pavement elevation while pumping to avoid making a bump.
10. Clean area and remove traffic control devices.

Precautions

Follow all safety procedures while working with hot liquid asphalt under high pressures and when in contact with water as foaming will occur.

**ENGINEERED PERFORMANCE STANDARD**

*0.48000 Hours per Square Yard*

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Crack/Joint Filling | CODE | 1360 |
|---|---|---|---|

**DESCRIPTION**

Placement of adhesive material into joints and cracks on portland cement concrete pavements to prevent the entry of water and foreign matter and related damage to the surfacing and base materials.

**MAINTENANCE ITEM** Concrete Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | | | | X | X | X | | | | X |

Perform in spring and fall when cracks and joints are 1/4 inch or wider.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Vehicle Operator | 1 |
| Maintenance Worker | 2 |
| Laborers | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 2 |
| Pickup | 1 |
| Air Compressor | 1 |
| Asphalt Kettle | 1 |
| Router | 1 |

**MATERIAL**

Joint Filler Material

**DAILY PRODUCTION**

8,000 - 12,000 Linear Feet

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements, March 1977, pg. 4-21, par. 4-6.

| WORK ACTIVITY | Crack/Joint Filling | CODE | 1360 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Completely remove old filler material from joint.
3. Rout joints and cracks as required to provide minimum depth of 3/4 inch.
4. Blow out debris and foreign material from joint with air compressor.
5. Apply new filler material to joint to within 1/4 inch of the pavement surface where subject to tracked vehicles and airfields; 1/8 inch for other surfaces.
6. Allow filler material to cure before permitting traffic.
7. Clean area and remove traffic control devices.

Precautions

1. Always use proper filler material for area treated - jet fuel resistant, blast resistant, etc.

**ENGINEERED PERFORMANCE STANDARD**

0.00480 Hours per Linear Foot

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Slab Replacement | CODE | 1370 |
|---|---|---|---|

**DESCRIPTION**

Removal and replacement of entire portland cement concrete pavement slabs, including the base courses as required to provide a structurally sound surface capable of supporting the required loads.

| MAINTENANCE ITEM | Concrete Surface Lane Mile |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

### PERSONNEL

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 3 |

### EQUIPMENT

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 2 |
| Loader/Backhoe | 1 |
| Air Compressor | 1 |
| Concrete Saw | 1 |
| Concrete Mixer | 1 |

### MATERIAL

Cement
Aggregate
Sand
Ready Mix Concrete
Base Aggregate

### DAILY PRODUCTION

40 - 60 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements, March 1977, pg. 4-44, par. 4-10.
2. Military Construction Guide Specification 02515
3. Air-entrained concrete will be used for all patching.
4. Identify drainage problems and install drains as required.
5. High early strength PCC may be used to return pavement to service with 24-48 hours.
6. Check treatment of keyed joints.

| WORK ACTIVITY | Slab Replacement | CODE | 1370 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark area to be removed.
3. Breakout the slab with air hammer down to base material.
4. Remove the broken up concrete pavement and load into truck for disposal at approved site.
5. Remove and replace deteriorated base material and recompact.
6. Use air compressor to blow out dust and loose debris from area.
7. Set forms along pavement edge.
8. Form joint if patch is along joint. Replacement joints will be doweled and built to specifications in reinforced pavements.
9. Place reinforcement material.
10. Place the concrete mixture, vibrate or tamp, and screed off flush with the adjacent surface.
11. Float and finish the surface texture to match the existing pavement.
12. Cover new surface with wet burlap or apply curing compound.
13. Set up traffic control devices to protect area until concrete has cured.
14. Clean area and remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**
1.12000 Hours per Square Yard

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| APPROVED | |
|---|---|
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Slabjacking | CODE | 1380 |
|---|---|---|---|

**DESCRIPTION**

Pumping of grout mixtures through holes cored in portland cement concrete pavements into void areas under the pavement to raise and realign the pavement slab by filling the void areas.

**MAINTENANCE ITEM** Concrete Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | | | | | X | X | X | | | X |

Do not schedule work during hot weather due to internal pressure in slab.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 2 |
| Vehicle Operator | 2 |
| Laborer | 3 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 2 |
| Grout Pumper | 1 |
| Concrete Mixer | 1 |
| Concrete Drill | 1 |
| Water Truck | 1 |

**MATERIAL**

Grout Mixture
Wooden Plugs

**DAILY PRODUCTION**

200 - 300 Square Yards

## REFERENCES - METHODS & SAFETY

1. AFM 91-23
2. TM 5-624, Chapter 4, Concrete Pavements, March 1977, Pg. 4-3, par. 4-8.

| WORK ACTIVITY | Slabjacking | CODE | 1380 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark locations for drilling pavement.
3. Drill holes 1-1/4 to 1-1/2 inch diameter through pavement thickness at designated locations.
4. Use straight edge or string line to establish desired elevation of pavement.
5. Insert grout hose nozzle into hole and pump grout mixture into holes at alternate locations until all voids are filled and the slab has been raised to the desired elevation.
6. Plug holes with hardwood plugs until grout has set. Remove plugs and fill holes with stiff mortar mixture.
7. Check pavement elevation while pumping to avoid making a bump.
8. Clean area and remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

0.25600 Hours per Square Yard

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Slab Grinding | CODE | 1390 |
|---|---|---|---|

**DESCRIPTION**

Grinding of portland cement concrete pavements to level and realign faulted areas between slabs or cracks within the slab by grinding the high side.

**MAINTENANCE ITEM** Concrete Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | | X | X | X | X | X |

Perform grinding where there is faulting between slabs or cracks within a slab.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 2 |
| Grinding Machine | 1 |
| Water Truck | 1 |
| Power Broom | 1 |

**MATERIAL**

**DAILY PRODUCTION**

150 - 200 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements

| WORK ACTIVITY | Slab Grinding | CODE | 1390 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark locations for grinding.
3. Adjust grinding machine to cut specified depth.
4. Grind pavement surface in direction of traffic, keeping parallel to pavement edge.
5. Haul waste material to designated disposal/stockpile area.
6. Repeat grinding operation until specified depth is obtained.
7. Sweep ground surface area to remove debris and loose material.
8. Clean area and remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

0.27429 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Surface Grooving | **CODE** | 1400 |
|---|---|---|---|

**DESCRIPTION**

Grooving portland cement concrete pavements by cutting a series of small grooves or cuts in the pavement surface to improve the surface skid resistance.

**MAINTENANCE ITEM** Concrete Surface Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 2 |
| Grooving Machine | 1 |
| Water Truck | 1 |
| Power Broom | 1 |

**MATERIAL**

**DAILY PRODUCTION**

300 - 400 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 4, Concrete Pavements.
2. Use longitudinal grooves on roadways.
3. Grooving of airfield pavements is done in the transverse direction.

| WORK ACTIVITY | Surface Grooving | CODE | 1400 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark locations for grooving.
3. Adjust machine for proper depth and width of grooves. Depth and width of grooves typically are 1/4 by 1/4 inch and spaced 1 1/4 inches apart.
4. Groove roadways longitudinally and airfields in the transverse direction.
5. Haul waste material to designated disposal area.
6. Sweep grooved area to remove debris and loose material.
7. Clean area and remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

0.12800 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Blade Unpaved Surface | CODE | 1510 |
|---|---|---|---|

**DESCRIPTION**

Blading, reshaping and smoothing unpaved surfaces, without adding material or widening, to restore crown, proper shape, drainage and smooth riding surface. Includes pulling and cleaning roadside ditches and sloping of shoulders as required.

**MAINTENANCE ITEM** Unpaved Surface Road Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

Blade when corrugations, ruts, or chuckholes cause an uncomfortable ride or unsafe conditions. Schedule most blading when adequate moisture conditions prevail to ensure proper compaction.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Laborer | 1 |

**EQUIPMENT**

| | |
|---|---|
| Motor Grader | 1 |
| Pickup | 1 |

**MATERIAL**

**DAILY PRODUCTION**

4 - 6 Road Miles

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 5, Miscellaneous Surfaces, March 1977, pg. 5-4, par. 5-5.3.

| WORK ACTIVITY | Blade Unpaved Surface | CODE | 1510 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices as required.
2. Blade surface by pulling material from side to center of road.
3. Blade material to level surface and provide a slight crown for drainage.
4. Ensure that windrows have been bladed out and no bumps or excess materials are left in driveways.
5. Remove any large rocks or other objects that would be hazardous to traffic.
6. Remove signs and warning devices.

**ENGINEERED PERFORMANCE STANDARD**

3.20000 Hours per Mile

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Add Gravel to Unpaved Surface | CODE | 1520 |
|---|---|---|---|

**DESCRIPTION**

Repairing and stabilizing unpaved surfaces by adding granular materials. Includes reshaping and compacting to correct ruts, potholes, washouts, corrugations and to restore crown, proper shape, drainage and a smooth riding surface.

| MAINTENANCE ITEM | Unpaved Surface Road Mile |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

Perform when ruts, potholes, washouts and corrugations cause an uncomfortable and unsafe riding condition and there is insufficient surface material on the roadway.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 2 |
| Vehicle Operator | 3 |
| Laborer | 1 |

**EQUIPMENT**

| | |
|---|---|
| Motor Grader | 1 |
| Dump Truck (5CY) | 2 |
| Water Truck | 1 |
| Roller | 1 |

**MATERIAL**

Aggregate/Gravel

**DAILY PRODUCTION**

0.5 - 1.0 Road Miles

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 5, Miscellaneous Surfaces, March 1977, pg. 5-4, par. 5.5.3.

| WORK ACTIVITY | Add Gravel to Unpaved Surface | CODE | 1520 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices as required.
2. Blade existing surface by pulling material from the two side ditches.
3. Cut high shoulders, as necessary.
4. Cut the roadway surface to bring up the larger aggregate to provide a better mixture for compaction.
5. Add additional aggregate material and spread with the grader.
6. Blade all material to a level surface with a slight crown for drainage.
7. Compact with roller or truck tires.
8. Ensure that windrows are removed and no excess material is left in driveways.
9. Remove signs and warning devices.

**ENGINEERED PERFORMANCE STANDARD**

64.00000 Hours per Mile

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Cement/Lime Stabilization | **CODE** | 1530 |
|---|---|---|---|

**DESCRIPTION**

Application of cement or lime mixtures to unpaved surface materials and mixing with water. Includes reshaping and compacting to provide proper cross-section, drainage and a smooth riding surface.

**MAINTENANCE ITEM** Unpaved Surface Road Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Vehicle Operator | 4 |
| Laborer | 1 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Motor Grader | 1 |
| Dump Truck (5CY) | 2 |
| Water Truck | 1 |
| Roller | 1 |
| Pulvimixer | 1 |

**MATERIAL**

Cement
Lime

**DAILY PRODUCTION**

0.5 - 1.0 Road Miles

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 5, Miscellaneous Surfaces, March 1977, pg. 5-6, par. 5-6.
2. TM 5-822-4, soil stabilization for Roads and Streets, June 1969.
3. See Figure 5-2, pg. 5-8, TM 5-624, for selection of lime or cement.

| WORK ACTIVITY | Cement/Lime Stabilization | CODE | 1530 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Blade existing surface by pulling material from the two side ditches.
3. Cut the roadway surface to bring up the larger pieces of aggregate.
4. Remove unsuitable materials.
5. Add additional stabilizing material, spread with the grader and mix thoroughly with pulvimixer.
6. Add water to obtain proper moisture content.
7. Blade all material to a level surface with a slight crown for drainage.
8. Roll surface and compact.
9. Ensure that windrows are removed and no excess material is left in driveways.
10. Remove traffic control devices.

Precautions

1. Careful control of proportions, moisture content and compaction are important.
2. Soils and aggregates with a high silt and clay content can not be used for cement stabilization.
3. Quicklime can cause burns and irritations to workers and should be used with caution.

**ENGINEERED PERFORMANCE STANDARD**

74.66666 Hours per Mile

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Dust Control | CODE | 1540 |
|---|---|---|---|

**DESCRIPTION**

Application of dust control materials on unpaved surfaces to control dust and to minimize detrimental effects on personnel, equipment and aircraft.

| MAINTENANCE ITEM | Unpaved Surface Road Mile |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | X | X | X | |

Perform in summer months on unpaved surfaces with high vehicular traffic.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Vehicle Operator | 1 |
| Maintenance Worker | 1 |

**EQUIPMENT**

| | |
|---|---|
| Distributor or Water Truck | 1 |

**MATERIAL**

Dust Palliatives

**DAILY PRODUCTION**

4 - 6 Road Miles

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 5, Miscellaneous Surfaces, March 1977, pg. 5-21, par. 5-7.
2.TM 5-830-3.

| WORK ACTIVITY | Dust Control | CODE | 1540 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices as required.
2. Mix palliatives *(according to manufacturers direction) in tank and drive to site.
3. Prewet surface to be treated.
4. Apply palliatives at designated rate per square yard.
5. Remove traffic control devices.

*NOTE: Some palliatives are placed dry and mixed into the surface with a motor grader.

**ENGINEERED PERFORMANCE STANDARD**

3.20000 Hours per Mile

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Blade Troop Trails | CODE | 1550 |
|---|---|---|---|

**DESCRIPTION**

Blading, reshaping and smoothing unpaved troop trails to remove vegetation and restore crown. Includes adding aggregate as necessary to maintain shape and integrity of trail.

**MAINTENANCE ITEM** Troop Trail Miles

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

Schedule blading when adequate moisture conditions prevail to ensure proper compaction.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Vehicle Operator | 1 |

**EQUIPMENT**

| | |
|---|---|
| Motor Grader | 1 |
| Dump Truck (5CY) | 1 |

**MATERIAL**

Aggregate

**DAILY PRODUCTION**

5 - 7 Trail Miles

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 5, Miscellaneous Surfaces, March 1977, pg. 5-1, par. 5-4.

| WORK ACTIVITY | Blade Troop Trails | CODE | 1550 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Blade surface by pulling material from side to center of trail.
2. Add additional aggregate as required and spread with the grader.
3. Blade material to level surface and provide a slight crown for drainage.
4. Remove any large rocks and other hazardous objects.
5. Ensure that windrows are bladed out and turn-outs are not blocked.

**ENGINEERED PERFORMANCE STANDARD**

2.66666 Hours per Mile

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Patch Paved Shoulders | **CODE** | 1710 |
|---|---|---|---|

**DESCRIPTION**

Patching of paved shoulders with asphalt concrete material to correct abrupt depressions, edge failures and other potential surface hazards to provide a smooth paved surface.

**MAINTENANCE ITEM** Paved Shoulder Mile

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

*Perform when edge failures and dropoffs are identified.*

## RESOURCE REQUIREMENTS

| **PERSONNEL** | **QUANTITY** |
|---|---|
| Vehicle Operator | 1 |
| Laborer | 2 |

| **EQUIPMENT** | |
|---|---|
| Dump Truck (5CY) | 1 |
| Vibratory Tamper | 1 |
| Saw/Jack Hammer | 1 |
| Heater-Blower | 1 |
| Straight Edge | 1 |

**MATERIAL**

Hot/Cold Asphalt Concrete Mix
Asphalt Tack Material

**DAILY PRODUCTION**

3 - 5 Tons Asphalt Concrete

## REFERENCES - METHODS & SAFETY


1. TR-M-294, September 1980.
2. TM 5-624, Chapter 3, Bituminous Pavements, March 1977, pg. 3-37,38, par. 3-5.6.7.1-3.

| WORK ACTIVITY | Patch Paved Shoulders | CODE | 1710 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Use truck warning lights and other traffic controls as required.
2. Mark area to be removed at least six inches beyond the damaged area.
3. Saw or jack hammer around the marked area.
4. Square the edges to provide a vertical face on the area to be patched.
5. Remove all loose debris from area to be patched.
6. Level and compact the base.
7. Make sure the area is dry. Use heater-blower if necessary.
8. Spray tack lightly on bottom and sides of area to be patched.
9. Place and rake premix in layers not exceeding 2 inches, compacting each layer with tamper.
10. Check with straight edge to make sure patch is level with surrounding surface.
11. Clean area and remove signs and safety devices.

**ENGINEERED PERFORMANCE STANDARD**

6.00000 Hours per Ton

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Seal Coating | CODE | 1720 |
|---|---|---|---|

**DESCRIPTION**

Seal coating of paved shoulders with hot liquid asphalt and cover aggregate to correct extensive cracking and spalling, prevent further deterioration and to provide an impervious surface.

**MAINTENANCE ITEM** Paved Shoulder Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 3 |
| Vehicle Operator | 2 |
| Laborer | 3 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 2 |
| Roller, Rubber Tire | 1 |
| Asphalt Distributor | 1 |
| Chip Spreader | 1 |

**MATERIAL**

Liquid Asphalt
Seal Aggregate

**DAILY PRODUCTION**

5,000 - 10,000 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 3, Bituminous Pavements, March 1977, pg. 3-1, par. 3-2.2, pg. 3-34, par. 3-5.6.4.1.
2. TR M-294, September 1980.
3. TM 5-822-8, Bituminous Pavements Standard Practice, July 1987, Pg. 2-5, par. 2-11.

| WORK ACTIVITY | Seal Coating | CODE | 1720 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Mark limits of area to be sealed.
3. Broom marked area with hand broom to remove dirt and loose material.
4. Apply liquid asphalt with calibrated distributor and stay within the marked area.
5. Spread seal aggregate in a uniform layer immediately after asphalt is sprayed.
6. Roll the sealed area with rubber tired roller until aggregate is seated.
7. Clean area and remove signs and safety devices.

**ENGINEERED PERFORMANCE STANDARD**

0.00960 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Blade Unpaved Shoulders | CODE | 1730 |
|---|---|---|---|

**DESCRIPTION**

Blading and reshaping unpaved or stabilized turf shoulders on paved roads to eliminate edge ruts, washouts, ridges, corrugations and high, overgrown shoulders. Includes major cutting and grading to restore proper shoulder slope for adequate drainage.

**MAINTENANCE ITEM** Unpaved Shoulder Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Vehicle Operator | 1 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Motor Grader | 1 |

**MATERIAL**

**DAILY PRODUCTION**

6 - 10 Shoulder Miles

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-3, par. 6-5.

| WORK ACTIVITY | Blade Unpaved Shoulders | CODE | 1730 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Cut excess material and pull ditches as necessary.
3. Pull windrow of excess material onto roadway edge.
4. Blade material back onto shoulder making sure all low spots are filled and add material as required.
5. Make extra passes as necessary to finish and compact shoulder and to provide proper slope and grade.
6. Remove loose material from pavement surface and clear driveways.
7. Remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

2.00000 Hours per Mile

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Add Gravel to Unpaved Shoulders | CODE | 1740 |
|---|---|---|---|

**DESCRIPTION**

Repairing unpaved shoulders on paved roads by adding granular materials. Includes reshaping and compacting to correct ruts, potholes, washouts, corrugations and to restore proper shoulder slope for adequate drainage.

**MAINTENANCE ITEM** Unpaved Shoulder Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 2 |
| Vehicle Operator | 3 |
| Laborer | 1 |

**EQUIPMENT**

| | |
|---|---|
| Motor Grader | 1 |
| Dump Truck (5CY) | 2 |
| Water Truck | 1 |
| Roller | 1 |

**MATERIAL**

Aggregate

**DAILY PRODUCTION**

125 - 175 Tons Material

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-3, par. 6-5.

| WORK ACTIVITY | Add Gravel to Unpaved Shoulders | CODE | 1740 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices as required.
2. Blade existing shoulders by pulling material from the two side ditches.
3. Cut high shoulders, as necessary.
4. Cut the shoulder surface to bring up the larger pieces of aggregate.
5. Add additional stabilizing material and spread with the grader.
6. Blade out all material to a level surface with a slight slope for drainage.
7. Compact with roller or truck tires.
8. Ensure that windrows are removed and no excess material is left in driveways.
9. Remove signs and warning devices.

**ENGINEERED PERFORMANCE STANDARD**

0.32000 Hours per Ton

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Roadway Sweeping | CODE | 2110 |
|---|---|---|---|

**DESCRIPTION**

Sweeping paved roadway surfaces, including parking areas, intersections and curb and gutter to remove dirt, sand and other debris.

**MAINTENANCE ITEM** Paved Roadway Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |

**EQUIPMENT**

| | |
|---|---|
| Mechanical Sweeper | 1 |

**MATERIAL**

**DAILY PRODUCTION**

14 - 20 Lane Miles

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.1.2.
2. Use signs and traffic control as required.

| WORK ACTIVITY | Roadway Sweeping | CODE | 2110 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Inspect equipment and make adjustments as necessary -- check brooms for effectiveness.
2. Fill sweeper with water.
3. Sweep designated areas as directed.
4. Materials collected by sweepers shall be dumped at approved sites.

**ENGINEERED PERFORMANCE STANDARD**

0.47059 Hours per Mile

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Runway Sweeping | CODE | 2120 |
|---|---|---|---|

**DESCRIPTION**

Sweeping paved runway surfaces, including taxiways and aircraft parking aprons to remove dirt, sand and other potential hazards to aircraft and personnel.

**MAINTENANCE ITEM** Runway Lane Mile

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Vehicle Operator | 1 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Mechanical Sweeper | 1 |
| Radio | 1 |

**MATERIAL**

**DAILY PRODUCTION**

14 - 20 Lane Miles

## REFERENCES - METHODS & SAFETY

1. Perform sweeping during periods of low or non-operation by aircraft.
2. TM 5-624, Chapter 12, Preventive Maintenance, March 1977.

| WORK ACTIVITY | Runway Sweeping | CODE | 2120 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Obtain clearance for sweeping runway and taxiway areas.
2. Inspect equipment and make adjustments as necessary -- check brooms for effectiveness.
3. Check operation of radio.
3. Sweep designated areas as directed.
4. Dump materials at approved sites.
5. Notify control tower when sweeping is complete.

**ENGINEERED PERFORMANCE STANDARD**

0 94118 Hours per Mile

# PLANNING GUIDELINE

**U.S. Army**
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**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Magnet Sweeping | **CODE** | 2130 |
|---|---|---|---|

**DESCRIPTION**

Magnet sweeping of paved roadways and runways to remove metal debris from surface to allow safe operation of equipment and aircraft.

| **MAINTENANCE ITEM** | Paved Surface Lane Mile |
|---|---|

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

**RESOURCE REQUIREMENTS**

**PERSONNEL**

| | **QUANTITY** |
|---|---|
| Equipment Operator | 1 |
| Laborer | 1 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Road Magnet | 1 |
| Radio | 1 |

**MATERIAL**

**DAILY PRODUCTION**

14 - 20 Lane Miles

**REFERENCES - METHODS & SAFETY**

| WORK ACTIVITY | Magnet Sweeping | CODE | 2130 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Inspect road magnet and adjust as required.
2. Test for adequate magnetic power.
3. Travel designated roadways and runways with magnet operating to remove all ferrous and magnetic materials.
4. Stop periodically to remove accumulated material and load into vehicle.
5. Dump materials as designated locations.

Note:

For sweeping runway and taxiway areas clearance must be obtained before starting work. Radio communications must be established.

**ENGINEERED PERFORMANCE STANDARD**

0.94118 Hours per Mile

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Machine Mowing | CODE | 2140 |
|---|---|---|---|

**DESCRIPTION**

Tractor mowing of roadsides and designated grounds area to maintain an attractive roadside and grounds, provide adequate sight distance and control erosion and drainage.

**MAINTENANCE ITEM** Mowable Acres

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

Schedule this activity in accordance with mowing policy.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Laborer | 1 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Tractor Mower | 1 |
| Trimmer | 1 |

**MATERIAL**

**DAILY PRODUCTION**

6 - 8 Acres

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.2.

| WORK ACTIVITY | Machine Mowing | CODE | 2140 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Check mower before leaving storage site.
2. Transport mower to worksite -- place signs and other warning devices.
3. Mow designated areas and try to keep mowed grass and weeds out of storm sewers and driveway culverts.
4. Maintenance worker places/moves warning devices and performs hand trimming as required.
5. Remove signs and other warning devices.

**ENGINEERED PERFORMANCE STANDARD**

2.28571 Hours per Acre

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Hand Mowing/Trimming | CODE | 2150 |
|---|---|---|---|

**DESCRIPTION**

Mowing and trimming areas, such as medians, steep slopes and other areas not accessible to tractors, with walk-behind mowers and other hand tools to maintain the vegetation and to control erosion and drainage.

**MAINTENANCE ITEM** Mowable Acres

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

Hand mowed areas should be scheduled in conjunction with tractor mowing to provide a uniform appearance.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Vehicle Operator | 1 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Equipment Trailer | 1 |
| Riding Mower | 2 |
| Weed Trimmer | 1 |

**MATERIAL**

**DAILY PRODUCTION**

24 Person Hours

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.2.

| WORK ACTIVITY | Hand Mowing/Trimming | CODE | 2150 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Check mower before leaving storage site.
2. Place signs and other warning devices. Use safety cones behind trailer for loading and unloading equipment.
3. Mow grass and weeds in designated areas.
4. Edge along median curbs, if needed.
5. Use trimmer or chemical growth retardant in tight areas.
6. Clean adjacent road and sidewalk of grass and weed clippings. Be careful not to clog up any drainage structures.
7. Remove signs and other warning devices.

**ENGINEERED PERFORMANCE STANDARD**

# PLANNING GUIDELINE

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**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Spraying/Weed Control | CODE | 2160 |
|---|---|---|---|

**DESCRIPTION**

Application of chemicals to vegetation and soil to eliminate undesirable growth or control growth in areas inaccessible to mowers, such as around guardrails, signs, fences, bridge ends, drainage ditches and other designated areas.

**MAINTENANCE ITEM** Mowable Acres

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | X | X | X | X | X | X |

Apply growth retardants and sterilizers to the designated areas in the early spring and through the growing season.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Maintenance Worker | 2 |

**EQUIPMENT**

| | |
|---|---|
| Spray Truck | 1 |

**MATERIAL**

Weed Control Chemicals

**DAILY PRODUCTION**

16 Person Hours

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.2.2.
2. Application of chemicals must be in accordance with E.P.A. regulations by a certified spray equipment operator.

| WORK ACTIVITY | Spraying/Weed Control | CODE | 2160 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Be sure warning lights are properly working.
2. Check equipment calibration and fill tank with water and proper amount of chemicals per manufacturer specifications.
3. Spray assigned work location. Pay particular attention to proper application and safety equipment, e.g., goggles, gloves, etc.
4. Clean equipment thoroughly.
5. Return unused chemicals to proper storage.

**ENGINEERED PERFORMANCE STANDARD**

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Reseeding and Sodding | **CODE** | 2170 |
|---|---|---|---|

**DESCRIPTION**

Reseeding and sodding of roadsides and grounds areas to restore vegetation for erosion control and appearance.

**MAINTENANCE ITEM** Mowable Acres

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | **QUANTITY** |
|---|---|
| Maintenance Worker | 2 |
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Stake Truck | 1 |
| Mulcher/Hydroseeder | 1 |
| Tractor/Cultivator/Seeder | 1 |
| Water Truck | 1 |

**MATERIAL**

Grass Seed
Straw
Sod

**DAILY PRODUCTION**

200 - 300 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.2.2.

| WORK ACTIVITY | Reseeding and Sodding | CODE | 2170 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

RESEEDING

1. Place signs and other warning devices.
2. Prepare soil by loosening, raking, leveling, or filling.
3. Sow/broadcast seed uniformly over area to be seeded.
4. Rack seed into soil in smaller areas.
5. Mulch seeded areas with straw.
6. Water seeded areas thoroughly.
7. Clean pavement of dirt and debris.
8. Remove signs and other warning devices.

SODDING

1. Delineate area to be replaced and measure.
2. Obtain equivalent amounts of rolled sod - provide for 5 percent wastage/overage.
3. Completely remove and haul off existing turf.
4. Grade uncovered area as required.
5. Unroll sod, lay out.
6. Irrigate area constantly for an extended period, as required by local conditions.

**ENGINEERED PERFORMANCE STANDARD**

0.19200 Hours per Square Yard

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Erosion Control | CODE | 2180 |
|---|---|---|---|

**DESCRIPTION**

Repair of erosion and failures on slopes to restore stability and the removal and disposal of eroded material.

**MAINTENANCE ITEM** Mowable Acres

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | X | X | X | | | | X |

Schedule this work as required and when possible in the spring and fall when moisture and temperature conditions are most favorable.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 2 |
| Loader | 1 |
| Hydroseeder | 1 |

**MATERIAL**

Fertilizer/Lime
Mulch/Straw
Grass Seed

**DAILY PRODUCTION**

48 Person Hours

## REFERENCES - METHODS & SAFETY

1. TM 5-820-1,2,3,4, Drainage and Erosion Control.

| WORK ACTIVITY | Erosion Control | CODE | 2180 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place signs and other warning devices.
2. Haul necessary material to job site.
3. Reshape slope and remove excess material from backslope and ditches.
4. Prepare ground and place fabric or other stabilizing material as required.
5. Apply lime, fertilizer, and seed.
6. Place mulch cover on seeded areas.
7. Remove signs and other warning devices.

**ENGINEERED PERFORMANCE STANDARD**

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Litter Pickup | CODE | 2190 |
|---|---|---|---|

**DESCRIPTION**

Pickup and dis, osal of litter, trash and other debris on roadsides, parking areas and other designated areas for aesthetic value, and to remove unsightly or hazardous objects that may obstruct drainage or damage mowing equipment or personnel.

**MAINTENANCE ITEM** Grounds Acres

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

Schedule and perform work identified as a result of routine road inspections. Litter barrels are to be emptied on a weekly basis.

**RESOURCE REQUIREMENTS**

**PERSONNEL**

| | QUANTITY |
|---|---|
| Vehicle Operator | 1 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |

**MATERIAL**

Plastic Litter Bags

**DAILY PRODUCTION**

50 - 100 Bags Litter

**REFERENCES - METHODS & SAFETY**

| WORK ACTIVITY | Litter Pickup | CODE | 2190 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices as warranted.
2. Drive slowly along the shoulder or traveled way in a dump truck equipped with a flashing light.
3. Proceed in a manner to assure maximum safety and minimum obstruction to traffic.
4. Stop off roadway, as necessary, to collect litter visible from traveled way or to empty litter barrels.
5. Dispose of litter at designated dumping areas.
6. Haul dead animals to designated dumping areas or bury on the right-of-way, if possible.

**ENGINEERED PERFORMANCE STANDARD**

0.32000 Hours per Bag

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Brush and Tree Cutting | CODE | 2200 |
|---|---|---|---|

**DESCRIPTION**

Cutting and removing brush and trees within the right-of-way and other areas to restore sight distances, eliminate traffic hazards and remove encroaching vegetation.

| MAINTENANCE ITEM | Grounds Acres |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | | | | | | |

Remove brush, trees, and branches from the right-of-way where growth interferes with clear vision, obstructs traffic signs or signals, or creates other traffic hazards.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Vehicle Operator | 1-2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 1 |
| Chipper | 1 |
| Bucket Truck | 0-1 |
| Chain Saw | 1 |
| Stump Grinder | 1 |

**MATERIAL**

Tree Dressing

**DAILY PRODUCTION**

6 Person Hours

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 6, Shoulders and Roadsides, March 1977, pg. 6-5, par. 6-6.3.2.3.
2. Follow safety procedures and wear approved safety equipment, e.g., hat, goggles, chaps, shoes, etc.
3. Use caution when cutting overhead branches and when near powerlines.

| WORK ACTIVITY | Brush and Tree Cutting | CODE | 2200 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place signs and other safety devices.
2. Cut brush, trees and tree branches on right-of-way.
3. Cut stumps flush to the ground.
4. Treat cut branches with tree dressing.
5. Chip brush and small branches and dispose on the right-of-way to a maximum depth of one inch if possible.
6. Haul all brush and trunks not chipped to a disposal area.
7. Grind stumps flush with ground surface.
8. Clear roadway of debris.
9. Remove signs and other safety devices.

**ENGINEERED PERFORMANCE STANDARD**

# PLANNING GUIDELINE

**U.S. Army**
***Engineering & Housing Support Center***
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Repair Fences | **CODE** | 2210 |
|---|---|---|---|

**DESCRIPTION**

Straightening and repair of broken or damaged fencing around government facilities to provide safety and security.

| **MAINTENANCE ITEM** | Fence Linear Feet |
|---|---|

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

**RESOURCE REQUIREMENTS**

**PERSONNEL**

| | **QUANTITY** |
|---|---|
| Vehicle Operator | 1 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Stake Truck | 1 |
| Post Hole Digger | 1 |
| Fence Stretcher | 1 |
| Fence Tools | |

**MATERIAL**

Fence Posts
Fence Rails
Fencing
Fence Hardware

**DAILY PRODUCTION**

150 - 200 Linear Feet

**REFERENCES - METHODS & SAFETY**

| WORK ACTIVITY | Repair Fences | CODE | 2210 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Remove damaged fence sections.
2. Lay out fence line and location.
3. Dig post holes, place posts and tamp, or place in concrete.
4. Install rails or fencing and pull tight.
5. Install appropriate gates and locks.
6. Clean work area.

**ENGINEERED PERFORMANCE STANDARD**

0.13714 Hours per Linear Foot

# PLANNING GUIDELINE

**U.S. Army**
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**Pavement Maintenance Management**

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|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Clean Grit Chambers | **CODE** | 2220 |
|---|---|---|---|

**DESCRIPTION**

Cleaning and removal of dirt, gravel and other debris from grit chambers of motor pool washracks.

| **MAINTENANCE ITEM** | Number Wash Racks |
|---|---|

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

**RESOURCE REQUIREMENTS**

**PERSONNEL**

| | **QUANTITY** |
|---|---|
| Vehicle Operator | 1 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |

**MATERIAL**

**DAILY PRODUCTION**

24 Person Hours

**REFERENCES - METHODS & SAFETY**

1. Use only approved disposal sites for debris.

| WORK ACTIVITY | Clean Grit Chambers | CODE | 2220 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Schedule cleaning during periods when wash rack is not in use.
2. Use hand shovels and brooms to remove debris from the grit chamber of washrack.
3. Hose chamber down to ensure drains are functioning properly.
4. Remove, clean and replace all screens over drains.
5. Load debris into truck and dispose of at designated site when truck is full or at end of shift.

**ENGINEERED PERFORMANCE STANDARD**

# PLANNING GUIDELINE

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**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Remove Roadway Debris | **CODE** | 2230 |
|---|---|---|---|

**DESCRIPTION**

Removal of roadway debris due to vehicle accidents and storm damage to provide safe use of the roadway.

| **MAINTENANCE ITEM** | Roadway Miles |
|---|---|

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | **QUANTITY** |
|---|---|
| Vehicle Operator | 1 |
| Laborer | 1 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Chain Saw | 1 |

**MATERIAL**

**DAILY PRODUCTION**

16 Person Hours

## REFERENCES - METHODS & SAFETY

1. Respond immediately to vehicle accidents and other hazardous debris on the pavement surface.

| WORK ACTIVITY | Remove Roadway Debris | CODE | 2230 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices as required to protect vehicular traffic and pedestrians.

VEHICLE ACCIDENTS

2. Remove debris remaining after tow trucks have removed damaged vehicles from accident scene.
3. Sweep roadway surface as required to remove glass and other hazards.
4. Spread sand or other absorbent material over fuel or oil spills.
5. Straighten damaged sign posts and notify supervisor if replacements are required.
6. Remove traffic control devices.

OTHER DEBRIS

2. Assess extent of debris to be removed.
3. Radio supervisor if additional equipment or personnel are required for major removals, e.g., large trees, boulders.
4. Remove small trees, branches and other debris that does not require additional equipment or personnel.
5. Load debris into truck for disposal at designated site. Trim overhanging material off trucks before transporting.
6. Remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

# PLANNING GUIDELINE

U.S. Army
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Pavement Maintenance Management

| APPROVED | |
|---|---|
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Clean/Reshape Ditches | CODE | 3110 |
|---|---|---|---|

**DESCRIPTION**

Cleaning and reshaping of roadside ditches along paved surfaces. Includes the removal, hauling and disposal of excess material to restore the original grade line and to ensure adequate drainage.

| MAINTENANCE ITEM | Unpaved Ditch Miles |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | X | X | X | X | | | |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 2 |
| Vehicle Operator | 2 |
| Laborer | 1 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 2 |
| Motor Grader | 1 |
| Loader/Backhoe | 1 |

**MATERIAL**

**DAILY PRODUCTION**

1.0 - 1.5 Ditch Miles

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 7, Drainage of Pavements, March 1977, pg 7-7, par. 7-6.
2. TM 5-820-1,-2,-3,-4, Drainage and Erosion Control.

| WORK ACTIVITY | Clean/Reshape Ditches | CODE | 3110 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place signs and traffic warning devices around work area.
2. Grade, cut, and shape ditch, removing excess material as required. Load excess material directly into dump trucks.
3. Clean out in front of driveway culverts by hand if necessary.
4. Haul excess material to pre-established dump site.
5. Remove signs and warning devices.

**ENGINEERED PERFORMANCE STANDARD**

32.00000 Hours per Mile

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Clean Culverts/Inlets | CODE | 3120 |
|---|---|---|---|

**DESCRIPTION**

Cleaning and removal of debris and silt as required from box culverts, drain pipe culverts, inlets, and storm sewers to maintain adequate drainage and prevent flooding.

**MAINTENANCE ITEM** Number Culverts/Inlets

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | X | X | X | X | X | X |

Clean annually in spring all culverts and storm sewers. Heavy emphasis after periods of heavy rainfall for problem locations.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Vehicle Operator | 1 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Loader | 1 |

**MATERIAL**

**DAILY PRODUCTION**

8 - 12 Culverts/Inlets

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 7, Drainage of Pavements, March 1977, pg 7-8, par. 7-7.
2. TM 5-820-1,-2,-3,-4, Drainage and Erosion Control.

| WORK ACTIVITY | Clean Culverts/Inlets | CODE | 3120 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place safety signs and other warning devices as required.
2. Remove debris and silt from inlet and outlet openings to restore original gradeline.
3. Remove accessible silted material from pipe culvert.
4. Inspect structure for damage.
5. Notify the Supervisor if ditches require reshaping.
6. Clean up work area and remove signs and warning devices.

**ENGINEERED PERFORMANCE STANDARD**

3.20000 Hours per Culvert

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Repair/Replace Culverts | **CODE** | 3130 |
|---|---|---|---|

**DESCRIPTION**

Repair or replacement of pipe culverts, drop inlets, catchbasins and manholes to provide proper drainage. Includes the repair of headwalls and sand bagging of culvert ends to prevent erosion and washouts.

**MAINTENANCE ITEM** Number Culverts/Inlets

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | X | X | | | | | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Vehicle Operator | 1 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Stake Truck | 1 |
| Backhoe | 1 |
| Vibratory Tamper | 1 |

**MATERIAL**

Culvert Pipe Sections/Ends
Base Material
Concrete, Ready Mix

**DAILY PRODUCTION**

0.5 - 1.0 Culverts/Inlets

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 7, Drainage of Pavements, March 1977, pg 7-8, par. 7-7.
2. TM 5-820-1,-2,-3,-4, Drainage and Erosion

| WORK ACTIVITY | Repair/Replace Culverts | CODE | 3130 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

CULVERTS

1. Place traffic control devices.
2. Cut surface, excavate material over existing pipe.
3. Remove and replace damaged sections of culvert as necessary.
4. Seal joints, ensure that pipe bedding is firm.
5. Backfill and tamp in 4 inch lifts.
6. Backfill to level grade.
7. Construct headwall when needed.
8. Clean area and remove traffic control devices.

INLETS, CATCHBASINS

1. Place traffic control devices.
2. Excavate as required. Break out and/or remove damaged structure or portion of structure. Haul debris to dump site.
3. Form and pour concrete to repair; use precast concrete slabs where possible; or rebuild using brick.
4. Backfill properly around work area after repairs have cured.
5. Restore area to original grade and condition. Notify supervisor of required pavement repairs.
6. Clean work area and remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

42.66667 Hours per Culvert

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Place Riprap | CODE | 3140 |
|---|---|---|---|

**DESCRIPTION**

Placing or replacing riprap on embankments and around bridges and drainage structures to prevent erosion and other failures.

**MAINTENANCE ITEM** Unpaved Ditch Miles

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | X | X | X | X | | | | | |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 2 |
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 2 |
| Truck Crane | 1 |
| Concrete Mixer | 1 |
| Loader/Backhoe | 1 |

**MATERIAL**

Rock/Riprap
Cement Mix

**DAILY PRODUCTION**

56 Person Hours

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 7, Drainage of Pavements, March 1977, pg. 7-16, par. 7-8.2.1.
2. TM 5-624, Chapter 8, Maintenance and Repair of Bridges, March 1977, pg. 8-13, par. 8-5.3.1.

| WORK ACTIVITY | Place Riprap | CODE | 3140 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices as required.
2. Inspect area and remove any debris.
3. Dump rock or riprap on top of embankment.
4. Place rock riprap in failed area with crane taking care not to damage surrounding riprap.
5. Place rock or broken concrete by hand to obtain uniform surface.
6. Mix grout/concrete using proper proportions.
7. Wash stone or broken concrete to remove all dirt and to moisten surface.
8. Place grout using brooms, shovels, and rods to force grout into all voids.
9. Cover grouted area with mats, wet, and keep wet for at least 4 days.
10. Check streambed in vicinity of work area and regrade, if required.
11. Clean up jobsite removing all debris and surplus material.
12. Remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Clean/Clear Canals | **CODE** | 3150 |
|---|---|---|---|

**DESCRIPTION**

The machine cleaning and reshaping of canals and non-roadway drainage ditches including the removal, hauling and disposal of excess material and sludge to restore the original grade line and to ensure adequate drainage at all times.

**MAINTENANCE ITEM** Canal Miles

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | X | X | X | X | X | X | X |

Canals and drainage ditches should be cleaned and reshaped to minimize flooding and control storm water run-off.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Vehicle Operator | 2 |

**EQUIPMENT**

| | |
|---|---|
| Gradall | 1 |
| Dump Truck (5CY) | 2 |

**MATERIAL**

**DAILY PRODUCTION**

300 - 500 Linear Feet

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 7, Drainage of Pavements, March 1977, pg. 7-7, par. 7-6.
2. Check with utility companies for underground utility locations.

| WORK ACTIVITY | Clean/Clear Canals | CODE | 3150 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place signs and warning devices around work area, especially when trucks are entering and leaving roadway.
2. Set grade stakes as required for proper grade.
3. Grade, cut and shape ditch removing excess material as required.
4. Waste excess material on ditch bank when possible, otherwise haul to designated disposal site.
5. Remove warning devices and signs.

**ENGINEERED PERFORMANCE STANDARD**

0 06000 Hours per Linear Foot

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Clean Bridge Surface | **CODE** | 4110 |
|---|---|---|---|

**DESCRIPTION**

Cleaning of bridge decks and bearing surfaces to remove sand and other debris, including the cleaning of expansion joints, drain holes and curbs.

**MAINTENANCE ITEM** Bridge Deck Square Yards

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | | | | X | X | X | | | | |

Perform bridge deck cleaning in fall and spring to remove accumulated debris and open drain holes.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Vehicle Operator | 1 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Air Compressor | 1 |
| Arrow Board | 1 |

**MATERIAL**

**DAILY PRODUCTION**

60 - 90 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 8, Maintenance and Repair of Bridge Decks, March 1977

| WORK ACTIVITY | Clean Bridge Surface | CODE | 4110 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices, and use warning arrow board.
2. Use air compressor and brooms to clean bridge deck and expansion joints.
3. Clean drain holes.
4. Load debris into dump truck.
5. Remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

0.32000 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Repair Timber Deck | **CODE** | 4120 |
|---|---|---|---|

**DESCRIPTION**

Repair and replacement of timber deck components to restore or preserve structural stability and smooth riding surface.

**MAINTENANCE ITEM** Timber Deck Square Yards

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | X | X | X | X | X | X |

Repair damaged planks that risk motorist safety immediately; others should be scheduled.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Maintenance Worker | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Stake Truck | 1 |

**MATERIAL**

Timber Planks
Nails/Bolts

**DAILY PRODUCTION**

20 - 40 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 8, Maintenance and Repair of Bridges, March 1977, pg. 8-6, par. 8-5.1 and par. 8.5.2.

| WORK ACTIVITY | Repair Timber Deck | CODE | 4120 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Remove all deteriorated material.
3. Repair or replace planks and timber decking.
4. Clean up work area.
5. Remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

1.33333 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Repair Bridge Deck | **CODE** | 4130 |
|---|---|---|---|

**DESCRIPTION**

Repair and patching of portland cement concrete and asphalt concrete bridge deck surfaces to maintain or restore structural stability and smooth riding surface.

**MAINTENANCE ITEM** Non-Timber Deck Square Yards

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | X | X | X | X | X | X |

Repair serious failures immediately upon notification. Schedule shallow deck spalls and minor defects throughout the year.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Vehicle Operator | 2 |
| Maintenance Worker | 2 |
| Laborer | 1 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |
| Dump Truck (5CY) | 1 |
| Stake Truck | 1 |
| Air Compressor | 1 |
| Concrete Saw | 1 |
| Concrete Mixer | 1 |

**MATERIAL**

Ready Mix Concrete
Epoxy
Curing Compound

**DAILY PRODUCTION**

20 - 40 Square Yards

## REFERENCES - METHODS & SAFETY

1. TM 5-624, Chapter 8, Maintenance and Repair of Bridges, March 1977, pg. 8-13, par 8-5.3.

| WORK ACTIVITY | Repair Bridge Deck | CODE | 4130 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Remove all deteriorated material.
3. Clean concrete and steel in patch area.
4. Place forms where needed.
5. Cover entire area with bonding agent.
6. Place mix and level with adjacent concrete.
7. Apply curing compound, cover with wet burlap, wet sand, wet bags, or use other approved curing method.
8. Texture of patch should conform to surrounding area.
9. Clean up work area.
10. Remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

1.60000 Hours per Square Yard

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Traffic Line Striping | **CODE** | 5110 |
|---|---|---|---|

**DESCRIPTION**

Striping the centerline, edge and lane markings on paved surfaces for traffic, parking and pedestrian control.

**MAINTENANCE ITEM** Traffic Line Miles

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | X | X | X | X | X | |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 2 |
| Stake Truck | 1 |
| Striping Machine | 1 |
| Arrow Board | 1 |

**MATERIAL**

Yellow Traffic Paint
White Traffic Paint
Reflectorized Beads

**DAILY PRODUCTION**

50,000 - 75,000 Linear Feet

## REFERENCES - METHODS & SAFETY

1. Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, March 1986.
2. TM 5-624, Chapter 10, Traffic Services, March 1977, pg. 10-2, par. 10-2.1 and par. 10-7.3.

| WORK ACTIVITY | Traffic Line Striping | CODE | 5110 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices.
2. Warning vehicle precedes striping machine to warn oncoming traffic.
3. Striping machine follows lead vehicle and sprays traffic lines.
4. Warning vehicle with arrow board follows to prevent traffic from driving on painted stripe.
5. Remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

0.00077 Hours per Linear Foot

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Repair Signs | CODE | 5120 |
|---|---|---|---|

**DESCRIPTION**

Repair, replacement and straightening of traffic signs, sign posts, delineators and other signs damaged by accident, vandalism, or deterioration to restore and maintain adequate control and guidance of traffic.

**MAINTENANCE ITEM**

Number Traffic Signs

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

Periodic night inspections should be performed to check reflectivity and positioning of signs.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Vehicle Operator | 1 |
| Maintenance Worker | 1 |

**EQUIPMENT**

| | |
|---|---|
| Pickup | 1 |

**MATERIAL**

Signs
Posts, Sign

**DAILY PRODUCTION**

15 - 20 signs

## REFERENCES - METHODS & SAFETY

1. Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, March 1986.
2. TM 5-624, Chapter 10, Traffic Services, March 1977, pg. 10-2, par. 10-2.2 and par. 10-7.

| WORK ACTIVITY | Repair Signs | CODE | 5120 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Identify installations requiring attention.
2. Replace signs which are difficult to read.
3. Straighten or replace bent delineators or posts.
4. Check torque on all bolts on breakaway sign supports.

**ENGINEERED PERFORMANCE STANDARD**

0.91429 Hours per Sign

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Repair Guardrail | CODE | 5130 |
|---|---|---|---|

**DESCRIPTION**

Repair of damaged or deteriorated guardrail/guiderail sections and posts to provide safe driving conditions.

**MAINTENANCE ITEM** Linear Feet Guardrail

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

### PERSONNEL

| | QUANTITY |
|---|---|
| Foreman | 1 |
| Equipment Operator | 1 |
| Maintenance Worker | 1 |
| Laborer | 1 |

### EQUIPMENT

| | |
|---|---|
| Pickup | 1 |
| Stake Truck | 1 |

### MATERIAL

Guardrail Section
Guardrail Posts
Wooden Spacers

### DAILY PRODUCTION

80 - 100 Linear Feet

## REFERENCES - METHODS & SAFETY

1. Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, March 1986.
2. TM 5-624, Chapter 10, Traffic Services, March 1977, pg. 10-3, par. 10-3.

| WORK ACTIVITY | Repair Guardrail | CODE | 5130 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place signs and traffic warning devices.
2. Remove all damaged rail and posts.
3. Re-align loose posts and compact the earth around the posts firmly.
4. Install new rail and tighten all hardware.
5. Clean work area of debris and load damaged sections into truck.
6. Remove signs and warning devices.

**ENGINEERED PERFORMANCE STANDARD**

0 35556 Hours per Linear Foot

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Repair Lights | CODE | 5140 |
|---|---|---|---|

**DESCRIPTION**

Routine servicing, maintenance and repair of roadway lighting, tunnel or parking area lights to provide adequate lighting to high density vehicular use and parking areas.

**MAINTENANCE ITEM** Number Lights

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Maintenance Specialist | 1 |
| Vehicle Operator | 1 |

**EQUIPMENT**

| | |
|---|---|
| Bucket Truck | 1 |

**MATERIAL**

Lamps
Luminaries
Gaskets
Cleaning Materials

**DAILY PRODUCTION**

12 - 16 Lights

## REFERENCES - METHODS & SAFETY

1. Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, March 1986.
2. TM 5-624, Chapter 10, Traffic Services, March 1977.

| WORK ACTIVITY | Repair Lights | CODE | 5140 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices as required.
2. Replace burned out lamps.
3. Repair or replace faulty luminaries.
4. Clean lighting fixtures.
5. Inspect and service luminaire components.
6. Remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

1.14286 Hours per Light

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Repair Signals | CODE | 5150 |
|---|---|---|---|

**DESCRIPTION**

Routine servicing, maintenance and repair of traffic signals and associated equipment to correct or prevent signal malfunction and to return signal to service.

**MAINTENANCE ITEM** Number Signals

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | X | X | X | X | X | X | X | X | X | X |

Schedule bulb replacement on a 12-month cycle.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Traffic Control Technician | 2 |

**EQUIPMENT**

| | |
|---|---|
| Bucket Truck | 1 |

**MATERIAL**

Traffic Light Bulbs
Traffic Light Lenses
Other Electrical

**DAILY PRODUCTION**

6 - 10 Signals

## REFERENCES - METHODS & SAFETY

1. Traffic Signal Manual of Installation and Maintenance Procedures, U.S. Department of Transportation.
2. Traffic Control Devices Handbook, U.S. Department of Transportation.
3. TM 5-624, Chapter 10, Traffic Services. March 1977, pg. 10-2, par. 10-2.3 and par. 10-7.4.

| WORK ACTIVITY | Repair Signals | CODE | 5150 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Place traffic control devices as required.
2. Inspect, clean and relamp signal heads.
3. Clean and replace lens, visors and reflectors as required.
4. Check signal heads to make sure they are properly fastened and aligned.
5. Clean and repair signal controller as required.
6. Determine cause of any signal malfunction and restore to service.
7. Report additional repairs required or replacement needs to supervisor.
8. Clean area and remove traffic control devices.

**ENGINEERED PERFORMANCE STANDARD**

2.00000 Hours per Signal

# PLANNING GUIDELINE

**U.S. Army**
**Engineering & Housing Support Center**
**Pavement Maintenance Management**

| | |
|---|---|
| **APPROVED** | |
| **EFFECTIVE** | |
| **SUPERSEDES** | |

| **WORK ACTIVITY** | Plow Roadways | **CODE** | 6110 |
|---|---|---|---|

**DESCRIPTION**

Plowing of snow from roadways and parking areas to provide access and reduce hazardous driving conditions.

**MAINTENANCE ITEM** Roadway Miles

| **PLANNING CRITERIA** | **OCT** | **NOV** | **DEC** | **JAN** | **FEB** | **MAR** | **APR** | **MAY** | **JUN** | **JUL** | **AUG** | **SEP** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | X | X | X | X | X | | | | | | |

Schedule plowing of snow on designated routes in accordance with snow control plan.

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Snow Plow | 1 |

**MATERIAL**

**DAILY PRODUCTION**

30 - 40 Roadway Miles

## REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-21, par. 11-4.3.2.1.

| WORK ACTIVITY | Plow Roadways | CODE | 6110 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Initiate plowing on assigned routes.
2. Maintain adequate speed for plow to throw snow.
3. Plow main traveled ways first; as storm subsides extend to include shoulders.
4. Stop occasionally to allow traffic to clear.
5. Be careful of obstacles such as manholes or soft shoulders.

AT END OF SHIFT

6. Make sure equipment is in good operating condition. Arrange for needed repairs immediately.
7. Fill fuel tanks to reduce fuel tank condensation.

**ENGINEERED PERFORMANCE STANDARD**

0 22857 Hours per Mile

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Plow Runways | CODE | 6120 |
|---|---|---|---|

**DESCRIPTION**

Plowing of snow from runways, taxiways, heliports and aircraft parking aprons to provide for safe aircraft operations and to reduce hazardous operating conditions.

| MAINTENANCE ITEM | Runway Lane Miles |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | X | X | X | X | X | | | | | | |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |

**EQUIPMENT**

| | |
|---|---|
| Dump Truck (5CY) | 1 |
| Snow Plow | 1 |

**MATERIAL**

**DAILY PRODUCTION**

8 Person Hours

## REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-23, par. 11-4.3.2.2.

| WORK ACTIVITY | Plow Runways | CODE | 6120 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Initiate plowing of assigned areas.
2. Maintain adequate speed for plow to throw snow.
3. Coordinate plowing with other runway snow removal efforts.
4. Observe the location of snow markers and avoid damaging runway lights.
5. Maintain communications with snow operations supervisor.

AT END OF SHIFT

6. Make sure equipment is in good operating condition. Arrange for needed repairs immediately.
7. Fill fuel tanks to reduce fuel tank condensation.

**ENGINEERED PERFORMANCE STANDARD**

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Rotary Snow Removal | CODE | 6130 |
|---|---|---|---|

**DESCRIPTION**

Removal of heavy snow accumulations from runways and other areas when it is required to remove the snow from the area being plowed or to load the snow into trucks for disposal.

**MAINTENANCE ITEM** Paved Surface Lane Miles

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | X | X | X | X | X | | | | | | |

**RESOURCE REQUIREMENTS**

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Maintenance Worker | 1 |

**EQUIPMENT**

| | |
|---|---|
| Rotary Snow Plow | 1 |

**MATERIAL**

**DAILY PRODUCTION**

16 Person Hours

**REFERENCES - METHODS & SAFETY**

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-20, par. 11-4.3.1.1, par. 11-4.3.2.1 and par. 11-4.3.2.2.

| WORK ACTIVITY | Rotary Snow Removal | CODE | 6130 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Initiate rotary snow plow operations at designated locations.
2. Remove accumulated snow and blow into dump trucks or off the runway surface.
3. Remove snow from windrow or stockpiled area and blow into trucks for disposal.
4. Observe the location of snow markers and avoid damaging runway lights and other fixed structures.
5. At the end of shift, make sure equipment is in good operating condition. Arrange for needed repairs immediately.

**ENGINEERED PERFORMANCE STANDARD**

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Load/Haul Snow | CODE | 6140 |
|---|---|---|---|

**DESCRIPTION**

Loading and hauling snow from windrowed snow, rotary plow operations or other areas when the snow must be hauled to a disposal site.

| MAINTENANCE ITEM | Paved Surface Lane Miles |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | X | X | X | X | X | | | | | | |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |
| Vehicle Operator | 3 |

**EQUIPMENT**

| | |
|---|---|
| Loader | 1 |
| Dump Truck (5CY) | 3 |

**MATERIAL**

**DAILY PRODUCTION**

32 Person Hours

## REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-21, par. 11-4.3.2.1.

| WORK ACTIVITY | Load/Haul Snow | CODE | 6140 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Initiate loading and hauling snow operations at designated locations.
2. Use loader to load snow from windrow or stockpiled area.
3. Load snow into dump trucks for disposal at approved sites.
4. Snow may also be loaded directly into trucks from rotary snow plow operations.
5. Remove snow completely from area being cleared.

**ENGINEERED PERFORMANCE STANDARD**

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Sweep Snow from Runways | CODE | 6150 |
|---|---|---|---|

**DESCRIPTION**

Sweeping runways to remove snow and slush from the pavement surface throughout the snowfall duration to maintain the center of the runway in a bare pavement condition.

| MAINTENANCE ITEM | Runway Lane Miles |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | X | X | X | X | X | | | | | | |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |

**EQUIPMENT**

| | |
|---|---|
| Mechanical Sweeper | 1 |

**MATERIAL**

**DAILY PRODUCTION**

8 Person Hours

## REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-23, par. 11-4.3.2.2.

| WORK ACTIVITY | Sweep Snow from Runways | CODE | 6150 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Initiate runway sweeping as soon as snowfall begins.
2. Start sweeping on the windward side of the runway and move the snow across the runway with the wind.
3. After sweeping is started, it must be completed for the entire width of the runway to avoid leaving a windrow on the runway or obstructing the runway center line.
4. Two or more sweepers should be assigned to sweep in echelon in order to clear the runway faster and to minimize delays of aircraft operations.
5. During heavy snowfall, one sweeper should be assigned exclusively to cover the center line of the runway at all times.
6. During sweeping operations, a final pass will be made with the sweeper to remove the snow from the runway lights.
7. Continue runway sweeping until the snow stops and the runways are clear of all snow. Two or more shifts may be required.

**ENGINEERED PERFORMANCE STANDARD**

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Apply Chemicals/Abrasives for Ice Control | CODE | 6160 |
|---|---|---|---|

**DESCRIPTION**

Application of approved chemicals and/or abrasives to runways, taxiways, roadways, parking areas and hazardous locations to remove ice and provide for safe vehicle and aircraft operations.

| MAINTENANCE ITEM | Paved Surface Lane |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | X | X | X | X | X | X | | | | | |

Perform this work on designated routes and runways in accordance with snow and ice control plan.

## RESOURCE REQUIREMENTS

| PERSONNEL | QUANTITY |
|---|---|
| Vehicle Operator | 1 |

| EQUIPMENT | |
|---|---|
| Dump Truck (5CY) | 1 |
| Chemical Spreader | 1 |

**MATERIAL**

Abrasives
Chemicals
Urea

**DAILY PRODUCTION**

15 - 20 Tons

## REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. Sodium or calcium chlorides are NOT permitted on airfields due to their corrosion of aircraft metals.
3. Urea, isopropyl alcohol and ethylene glycol are approved anti-icing and deicing agents for airfields.
4. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
5. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-24, par. 11-5.

| WORK ACTIVITY | Apply Chemicals/Abrasives for Ice Control | CODE | 6160 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. All spreaders are to be tested and calibrated before the snow season.
2. Initiate application of abrasives and/or chemicals as directed by snow control supervisor.
3. Drive near the centerline to apply the materials toward the center of the roadway or runway.
4. Treat only ice and dangerous spots during the storm.
5. Apply materials at specified application rate - DO NOT EXCEED.
6. DO NOT apply materials within 10 feet of railroad grade crossings.
7. At End of Shift make sure equipment is in good operating condition. Arrange for repairs immediately if needed.
8. Equipment should be cleaned after use to prevent corrosion.

**ENGINEERED PERFORMANCE STANDARD**

0.45714 Hours per Ton

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Clear Snow and Ice from Runways Lights | CODE | 6170 |
|---|---|---|---|

**DESCRIPTION**

Clearing snow and ice from runway edge lights to maintain visibility and provide runway clearance for aircraft movement and safe operations.

| MAINTENANCE ITEM | Number Runway Lights |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | X | X | X | X | X | X | | | | | |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Equipment Operator | 1 |

**EQUIPMENT**

| | |
|---|---|
| Mechanical Sweeper | 1 |
| or | |
| Rotary Snow Blower | 1 |

**MATERIAL**

**DAILY PRODUCTION**

100 - 150 Lights

## REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-23, par. 11-4.3.2.2.

| WORK ACTIVITY | Clear Snow and Ice from Runway Lights | CODE | 6170 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Initiate runway light clearing in conjunction with runway sweeping.
2. In-pavement runway lights must be cleared with sweeper or rubber snow plow blade.
3. During heavy snowfalls, it may be necessary to use the rotary snow blower to clear a path in front of the lights so that the sweeper air blast can be used to clear the snow from elevated runway lights.
4. Continue runway light clearing until the snowfall stops.

**ENGINEERED PERFORMANCE STANDARD**

0.06400 Hours per Light

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Clear Walkways | CODE | 6180 |
|---|---|---|---|

**DESCRIPTION**

Removal of snow and ice from sidewalks and other walkways to provide safe passage and use for personnel.

**MAINTENANCE ITEM** Linear Feet Sidewalk

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | X | X | X | X | X | X | | | | | |

*Clear designated walkways in accordance with snow removal policy.*

## RESOURCE REQUIREMENTS

**PERSONNEL** — **QUANTITY**

| | |
|---|---|
| Maintenance Worker | 1 |
| Laborer | 1 |

**EQUIPMENT**

| | |
|---|---|
| Small Tractor/Plow | 1 |

**MATERIAL**

Abrasives
Chemicals

**DAILY PRODUCTION**

2,000 - 3,000 Linear Feet

## REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-21, par. 11-4.3.2.1.

| WORK ACTIVITY | Clear Walkways | CODE | 6180 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

1. Visually inspect walkways and sidewalks to determine areas warranting work.
2. Sweep and shovel entry ways and handicap ramps as snow accumulates.
3. Use power equipment to remove snow and push to areas for removal.
4. Perform hand sweeping or ice removal as necessary on remaining ice and snow.
5. Treat icy areas with sand/abrasives.

**ENGINEERED PERFORMANCE STANDARD**

0.00640 Hours per Linear Foot

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
*Pavement Maintenance Management*

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Install/Remove Snow Fence | CODE | 6190 |
|---|---|---|---|

**DESCRIPTION**

Installation and removal of snow fences at selected locations to minimize and reduce the effect of snow drifts on roadways and runways.

| MAINTENANCE ITEM | Number Locations |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | | | | | | X | | | | |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Vehicle Operator | 1 |
| Maintenance Worker | 1 |
| Laborer | 1 |

**EQUIPMENT**

| | |
|---|---|
| Stake Truck | 1 |
| Dump Truck (5CY) | 1 |
| Air Compressor | 1 |

**MATERIAL**

Snow Fence
Metal Posts
Wire

**DAILY PRODUCTION**

750 - 1,000 Linear Feet

## REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-21, par. 11-4.3.2.1.
4. Install snow fence at preselected locations.

| WORK ACTIVITY | Install/Remove Snow Fence | CODE | 6190 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

INSTALL

1. Dig holes for terminal post.
2. Set post and tamp.
3. Brace post.
4. Attach 5 wires between post and tie.
5. Attach fence.

REMOVE

1. Remove wire and post.
2. Remove fence and roll tightly.
3. Load fence and posts into truck.

**ENGINEERED PERFORMANCE STANDARD**

0.02743 Hours per Linear Foot

# PLANNING GUIDELINE

U.S. Army
Engineering & Housing Support Center
Pavement Maintenance Management

| | |
|---|---|
| APPROVED | |
| EFFECTIVE | |
| SUPERSEDES | |

| WORK ACTIVITY | Install/Remove Snow Markers | CODE | 6200 |
|---|---|---|---|

**DESCRIPTION**

Installation and removal of snow markers to identify the locations of airfield lighting systems and all potential snow plowing obstacles.

| MAINTENANCE ITEM | Number Locations |
|---|---|

| PLANNING CRITERIA | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | | | | | | | X | X | | | X |

## RESOURCE REQUIREMENTS

**PERSONNEL**

| | QUANTITY |
|---|---|
| Vehicle Operator | 2 |
| Laborer | 2 |

**EQUIPMENT**

| | |
|---|---|
| Stake Truck | 1 |
| Dump Truck (5CY) | 1 |
| Air Compressor | 1 |

**MATERIAL**

Snow Markers

**DAILY PRODUCTION**

100 - 300 Markers

## REFERENCES - METHODS & SAFETY

1. Installation Snow and Ice Control Plan.
2. AFM 91-14, Airfield and Base Snow and Ice Removal and Control.
3. TM 5-624, Chapter 11, Snow and Ice Control, March 1977, pg. 11-6, par. 11-3.2.4.
4. Install markers at preselected locations.

| WORK ACTIVITY | Install/remove Snow Markers | CODE | 6200 |
|---|---|---|---|

**RECOMMENDED WORK PROCEDURE**

Place traffic control devices as required.

INSTALL

1. Locate previous placement.
2. Drill hole 15" to 18".
3. Place post.
4. Tamp and guy as necessary.
5. Attach to sign post when appropriate.

REMOVE

1. Remove guy or attachment to sign post.
2. Remove post and place in truck.

**ENGINEERED PERFORMANCE STANDARD**

0.16000 Hours per Marker

# APPENDIX C: PERSONNEL, EQUIPMENT AND MATERIAL RESOURCE LIST

## U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System - Phase 1

## PERSONNEL RESOURCE LIST

| CODE | CLASSIFICATION | MEASUREMENT UNIT |
|---|---|---|
| 1110 | Foreman | Hour |
| 1120 | Equipment Operator | Hour |
| 1130 | Vehicle Operator | Hour |
| 1140 | Traffic Control Technician | Hour |
| 1150 | Maintenance Worker | Hour |
| 1160 | Laborer | Hour |

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System - Phase 1

EQUIPMENT RESOURCE LIST

| CODE | CLASSIFICATION | MEASUREMENT UNIT |
|---|---|---|
| 3010 | Pickup | Hour |
| 3020 | Pickup, Crewcab | Hour |
| 3030 | Stake Truck | Hour |
| 3040 | Dump Truck (5 CY) | Hour |
| 3050 | Dump Truck (10 CY) | Hour |
| 3060 | Bucket Truck | Hour |
| 3070 | Truck Crane | Hour |
| 3080 | Asphalt Distributor | Hour |
| 3090 | Spray Truck | Hour |
| 3100 | Water Truck | Hour |
| 3200 | Backhoe | Hour |
| 3210 | Front-end Loader | Hour |
| 3220 | Motor Grader | Hour |
| 3230 | Gradall | Hour |
| 3240 | Mechanical Sweeper | Hour |
| 3250 | Tractor | Hour |
| 3260 | Tractor Mower | Hour |
| 3270 | Roller, Steel Wheel | Hour |
| 3280 | Roller, Rubber Tire | Hour |
| 3290 | Power Rotary Broom | Hour |
| 3300 | Paver, Asphalt | Hour |
| 3310 | Grinding Machine | Hour |
| 3320 | Grooving Machine | Hour |
| 4010 | Air Compressor | Hour |
| 4020 | Air Hammer | Hour |
| 4030 | Arrow Board | Hour |
| 4040 | Asphalt Kettle | Hour |
| 4050 | Chain Saw | Hour |
| 4060 | Chemical Spreader | Hour |
| 4070 | Chipper | Hour |
| 4080 | Chip Spreader | Hour |
| 4090 | Concrete Drill | Hour |
| 4100 | Concrete Mixer | Hour |
| 4110 | Concrete Saw | Hour |
| 4120 | Crack Filler | Hour |
| 4130 | Cultivator | Hour |
| 4140 | Drill | Hour |
| 4150 | Equipment Trailer | Hour |
| 4160 | Grinder | Hour |

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System - Phase 1

EQUIPMENT RESOURCE LIST

| CODE | CLASSIFICATION | MEASUREMENT UNIT |
|---|---|---|
| 4170 | Grout Mixer | Hour |
| 4180 | Grout Pumper | Hour |
| 4190 | Heater Blower | Hour |
| 4200 | Hydroseeder | Hour |
| 4210 | Mixing Drum | Hour |
| 4220 | Mulcher | Hour |
| 4230 | Post Hole Digger | Hour |
| 4240 | Pulvimixer | Hour |
| 4250 | Riding Mower | Hour |
| 4260 | Road Magnet | Hour |
| 4270 | Rotary Snow Plow | Hour |
| 4280 | Router | Hour |
| 4290 | Sand Blaster | Hour |
| 4300 | Seeder | Hour |
| 4310 | Snow Plow | Hour |
| 4320 | Spreader Box | Hour |
| 4330 | Striping Machine | Hour |
| 4340 | Vibratory Tamper | Hour |
| 4350 | Water Tank | Hour |
| 4360 | Weed Trimmer | Hour |

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System - Phase 1

MATERIAL RESOURCE LIST

| CODE | CLASSIFICATION | MEASUREMENT UNIT |
|---|---|---|
| 5010 | Abrasives, Snow Removal | cubic yard |
| 5020 | Aggregate, Other | cubic yard |
| 5030 | Aggregate, Seal | cubic yard |
| 5040 | Asphalt, Liquid | gallon |
| 5050 | Asphalt, Porous Friction | ton |
| 5060 | Asphalt, Concrete Mix | ton |
| 5070 | Asphalt, Tack Material | gallon |
| 5080 | Base Material | cubic yard |
| 5090 | Cement | bag |
| 5100 | Chemicals, Snow Removal | ton |
| 5110 | Chemicals, Weed Control | gallon |
| 5120 | CMP End | each |
| 5130 | CMP Section | feet |
| 5140 | Concrete, Ready Mix | cubic yard |
| 5150 | Crack Sealant | gallon |
| 5160 | Curing Compound | gallon |
| 5170 | Dust Palliative | pound |
| 5180 | Epoxy Mix | gallon |
| 5190 | Fence Hardware | dollar |
| 5200 | Fence Post | each |
| 5210 | Fence Rail | each |
| 5220 | Fencing | square feet |
| 5230 | Fertilizer | pound |
| 5240 | Gasket | each |
| 5250 | Grass Seed | pound |
| 5260 | Grout Mixture | bag |
| 5270 | Guardrail End | each |
| 5280 | Guardrail Post | each |
| 5290 | Guardrail Section | each |
| 5300 | Guardrail Wooden Spacer | each |
| 5310 | Joint Filler | gallon |
| 5320 | Lamps, Roadway | each |
| 5330 | Lime | pound |
| 5340 | Luminaries | each |
| 5350 | Other Electrical | dollar |
| 5360 | Plastic Litter Bag | each |
| 5370 | Plugs Hardwood | each |
| 5380 | Post, Metal | each |
| 5390 | Post, Sign Wood | each |
| 5400 | RCP End | each |

U.S. ARMY CORPS OF ENGINEERS
Maintenance Management System - Phase 1

MATERIAL RESOURCE LIST

| CODE | CLASSIFICATION | MEASUREMENT UNIT |
|---|---|---|
| 5410 | RCP Section | feet |
| 5420 | Reflectorized Beads | pound |
| 5430 | Rock, Riprap | cubic yard |
| 5440 | Sand | cubic yard |
| 5450 | Sealer, Fuel Resistant | gallon |
| 5460 | Sign, Traffic | each |
| 5470 | Snow Fence | feet |
| 5480 | Snow Marker | each |
| 5490 | Sod | square yard |
| 5500 | Straw | bale |
| 5510 | Timber Plank | linear feet |
| 5520 | Traffic Light Bulb | each |
| 5530 | Traffic Light Lens | each |
| 5540 | Traffic Paint, White | gallon |
| 5550 | Traffic Paint, Yellow | gallon |
| 5560 | Urea | pound |

# APPENDIX D: DEMONSTRATION MAINTENANCE MANAGEMENT PLANNING REPORTS

Sierra Army Depot

Roads and Grounds Branch


| TITLE | PAGE |
|---|---|
| Feature Inventory Data | D-2 |
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| Work Program and Budget Report | D-8 |
| Deferred Budget | D-9 |
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| Material/Other Requirements Report | D-13 |
| Workload Distribution | D-14 |
| Work Calendar | D-15 |
| Performance Report | D-16 |
| Location Performance Report | D-20 |
| Activity Listing Report | D-23 |

| CODE | FEATURE | MEASRMNT UNITS | MGMT UNIT | TOTAL INVENTORY | CONDITIONS 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| 1110 | BITUMINOUS ROAD | MILES | ROAD | 260.00 | .00 | .00 | .00 |
| 1300 | CONCRETE PAVEME | K SQ YDS | ROAD | 200.00 | .00 | .00 | .00 |
| 1310 | RUNWAY/TAXIWAY | K SQ YDS | ROAD | 150.00 | .00 | .00 | .00 |
| 1500 | UNPAVED ROAD | MILES | ROAD | 300.00 | .00 | .00 | .00 |
| 1600 | TOTAL ROADWAY | MILE | ROAD | 760.00 | .00 | .00 | .00 |
| 1700 | UNPAVED SHLDRS | MILES | ROAD | 1,000.00 | .00 | .00 | .00 |
| 1820 | RR SWITCH | EA | ROAD | 10.00 | .00 | .00 | .00 |
| 1830 | RR TRACK | MILES | ROAD | 35.00 | .00 | .00 | .00 |
| 2000 | MNTND GROUNDS | ACRES | ROAD | 400.00 | .00 | .00 | .00 |
| 2100 | MOWABLE ROADSID | ACRES | ROAD | 400.00 | .00 | .00 | .00 |
| 2140 | MOWABLE LAWN | ACRE | ROAD | 150.00 | .00 | .00 | .00 |
| 2220 | FENCE | LIN FT | ROAD | 10,000.00 | .00 | .00 | .00 |
| 5120 | SIGNS | EA | ROAD | 300.00 | .00 | .00 | .00 |
| 7110 | GARBAGE TRUCK | EA | ROAD | 2.00 | .00 | .00 | .00 |
| 7120 | LANDFILL | ACRE | ROAD | 40.00 | .00 | .00 | .00 |
| 7130 | LEACHATE WELLS | EA | ROAD | 6.00 | .00 | .00 | .00 |
| 9100 | YEAR | EA | ROAD | 1.00 | .00 | .00 | .00 |

| CODE | TYPE | NAME |
|---|---|---|
| A0001 | I | A STREET |
| A001P | P | A STREET PARKING |
| A0021 | I | B AVE. |
| A0031 | I | C AVE. |
| A004P | P | C AVE PARKING |
| A0051 | I | CALIFORNIA AVE. |
| A0061 | I | CASCADE AVE |
| A0071 | I | CIRCLE AVE |
| A0081 | I | D AVE |
| A0091 | I | D STREET |
| A0101 | I | DAVID S. HALL AVE |
| A011P | P | DAVID S. HALL PARKING |
| A0121 | I | DESERT AVE |
| A0131 | I | E AVE |
| A014P | P | E AVE PARKING |
| A015P | P | EM BARRACKS PARKING |
| A016P | P | FIREHOUSE PARKING |
| A0171 | I | H STREET |
| A018P | P | HEADQUARTERS PARKING |
| A0191 | I | HEALTH CLINIC ACCESS |
| A020P | P | HEALTH CLINIC PARKING |
| A021 | I | LASSEN AVE |
| A022 | I | LINE AVE |
| A023 | I | NEVADA AVE |
| A024 | I | PLUMAS AVE |
| A025 | I | SERVICE AVE |
| A026 | I | SIERRA AVE |
| A027 | I | SKEDADDLE AVE |
| A028 | I | TAHOE AVE |
| A029 | I | TUFA AVE |
| A030 | P | T-7 PARKING |
| A031 | J | T-26 ACCESS |
| A032 | P | T-26 PARKING |
| A033 | P | T-84 PARKING |
| A034 | P | T-201 PARKING |
| A035 | P | T-2069 PARKING |
| A036 | P | YUBA AVE PARKING |
| A037 | I | FIRST AVE |
| A038 | I | SECOND AVE |
| A039 | P | SECOND AVE PARKING |
| A040 | I | FOURTH STREET |
| A045 | I | B STREET |
| A046 | A | BLDG P-130 APRON |
| A047 | P | BLDG P-142 PARKING |
| A048 | A | BLDG P-202 APRON |
| A049 | P | BLDG P-203 PARKING |
| A050 | P | BLDG P-205 PARKING |
| A051 | P | BLDG P-206 PARKING |
| A052 | P | BLDG P-207 PARKING |
| A053 | P | BLDG P-208 PARKING |
| A054 | P | BLDG P-209 PARKING |
| A055 | P | BLDG P-210 PARKING |
| A056 | I | BLDG P-211 ACCESS |

| CODE | TYPE | NAME |
|---|---|---|
| A057 | P | BLDG P-211 PARKING |
| A058 | P | BLDG T-55 PARKING |
| A059 | A | BLDG T-81 APRON |
| A060 | A | BLDG T-82 APRON |
| A061 | I | BLDG T-141 ACCESS |
| A062 | P | BLDG T-227 PARKING |
| A063 | P | BLDG T-301 PARKING |
| A064 | P | BLDG T-302 PARKING |
| A065 | P | BLDG T-303 PARKING |
| A066 | P | BLDG T-304 PARKING |
| A067 | P | BLDG T-305 PARKING |
| A068 | P | BLDG T-306 PARKING |
| A069 | P | BLDG T-307 PARKING |
| A070 | P | BLDG T-308 PARKING |
| A071 | P | BLDG T-309 PARKING |
| A072 | P | BLDG T-310 PARKING |
| A073 | P | BLDG T-311 PARKING |
| A074 | P | BLDG T-351 PARKING |
| A075 | P | BLDG T-352 PARKING |
| A076 | P | BLDG T-353 PARKING |
| A077 | P | BLDG T-354 PARKING |
| A078 | P | BLDG T-355 PARKING |
| A079 | P | BLDG T-356 PARKING |
| A080 | P | BLDG T-357 PARKING |
| A081 | P | BLDG T-358 PARKING |
| A082 | P | BLDG T-359 PARKING |
| A083 | P | BLDG T-360 PARKING |
| A084 | P | BLDG T-361 PARKING |
| A085 | P | BLDG T-362 PARKING |
| A086 | P | BLDG T-363 PARKING |
| A087 | P | BLDG T-354 PARKING |
| A088 | P | BLDG T-365 PARKING |
| A089 | P | BLDG T-366 PARKING |
| A090 | P | BLDG T-1218 PARKING |
| A091 | I | C STREET |
| A092 | P | CHAPEL PARKING |
| A093 | I | DONNER AVE |
| A094 | I | E STREET |
| A095 | P | EQUESTRIAN STABLE PARKING |
| A096 | I | EQUESTRIAN STABLE ROAD |
| A097 | I | F STREET |
| A098 | I | FLAGLER AVE |
| A099 | I | G STREET |
| A100 | I | MINERAL DUMP ROAD |
| A101 | M | MOTOR POOL |
| A102 | I | ORE STORAGE ROAD |
| A103 | P | ORDINANCE TANKS PARKING |
| A104 | I | RESERVOIR ACCESS ROAD |
| A105 | I | STORAGE ACCESS ROAD |
| A106 | A | WEIGH SCALE APRON |
| A107 | I | WEST SEWAGE DISPOSAL ROAD |
| A108 | A | X LINE LOADING APRON |
| A109 | I | 3RD AVE |
| A110 | I | 2ND AVE |

| CODE | TYPE | NAME |
|---|---|---|
| A111 | I | 3RD STREET |
| A112 | I | 4TH STREET |
| A113 | I | 5TH STREET |
| A114 | I | 6TH STREET |
| A115 | I | 7TH STREET |
| A116 | I | 8TH STREET |
| A117 | I | 9TH STREET |
| AZONE | Z | ZONE A |
| BZONE | Z | ZONE B |
| CZONE | Z | ZONE C |
| DEPOT | Z | ANY OTHER UNASSIGNED LOC |
| DZONE | Z | ZONE D |
| EZONE | Z | ZONE E |
| FZONE | Z | ZONE F |
| GZONE | Z | ZONE G |
| HZONE | Z | ZONE H |
| IZONE | Z | ZONE I |
| JZONE | Z | ZONE J |
| KZONE | Z | ZONE K |
| LZONE | Z | ZONE L |
| MZONE | M | ZONE M |
| NZONE | Z | ZONE N |
| 0000 | A | AIRFIELD PARKING APRON |
| 0001 | X | EAST AIRFIELD OVERRUN |
| 0002 | R | AIRFIELD RUNWAY |
| 0003 | T | AIRFIELD TAXIWAY |
| 0004 | X | WEST AIRFIELD OVERRUN |
| OZONE | Z | ZONE O-AMEDEE AIRFIELD |

| CODE | NAME | TYPE | COST | INVENTORY | AVAIL/UNITS |
|---|---|---|---|---|---|
| 1110 | MNT GEN FRMN-EW | L | 15.02 | 1.00 | 100.0 |
| 1120 | ENG EQUIP OP | L | 14.86 | 3.00 | 100.0 |
| 1130 | MOT VEH OP | L | 10.60 | 3.00 | 100.0 |
| 1160 | LABORER | L | 8.67 | 3.00 | 100.0 |
| 1170 | RR MNT OP | L | 9.72 | 2.00 | 100.0 |
| 3010 | PICKUP-2WD | E | 1.50 | 2.00 | 100.0 |
| 3011 | PICKUP-4WD | E | 1.50 | 1.00 | 100.0 |
| 3040 | DUMP TRUCKS-5YD | E | 3.55 | 4.00 | 100.0 |
| 3051 | BELLY DUMP-18YD | E | 6.05 | 1.00 | 100.0 |
| 3061 | GARBAGE TRUCK | E | 12.00 | 1.00 | 100.0 |
| 3090 | WATER DISTRIBUT | E | 6.65 | 2.00 | 100.0 |
| 3200 | BACKHOE | E | 10.45 | 1.00 | 100.0 |
| 3210 | FRONT LOADER | E | 8.88 | 1.00 | 100.0 |
| 3211 | FRONT LOADER | E | 18.95 | 1.00 | 100.0 |
| 3220 | ROAD GRADER | E | 12.05 | 2.00 | 100.0 |
| 3250 | TRACTOR | E | 2.00 | 1.00 | 100.0 |
| 3260 | TRACTOR MOWER | E | 2.00 | 2.00 | 100.0 |
| 3270 | ROLLER | E | 12.05 | 1.00 | 100.0 |
| 3280 | STREET SWEEPER | E | 4.15 | 1.00 | 100.0 |
| 3281 | TOWED SWEEPER | E | 2.30 | 1.00 | 100.0 |
| 3282 | RUNWAY SWEEPER | E | 6.05 | 1.00 | 100.0 |
| 3283 | SWEEPER W/MAGNT | E | 6.05 | 1.00 | 100.0 |
| 3410 | SCRAPER | E | 39.60 | 1.00 | 100.0 |
| 3420 | BULLDOZER | E | 26.05 | 1.00 | 100.0 |
| 4180 | RIDING MOWERS | E | 4.15 | 2.00 | 100.0 |
| 4240 | STRPNG MCHN-SP | E | 1.70 | 1.00 | 100.0 |
| 4250 | VIBRATORY TAMP | E | 1.40 | 1.00 | 100.0 |
| 5010 | ABRASV-SNW RMVL | M | 30.00 | .00 | CU YD |
| 5020 | AGGREGATE-OTHER | M | 10.00 | .00 | CU YD |
| 5030 | AGGREGATE-SEAL | M | 15.00 | .00 | CU YD |
| 5040 | ASPHALT, LIQUID | M | 5.00 | .00 | GALLON |
| 5060 | ASPHALT-PREMIX | M | 45.00 | .00 | TON |
| 5070 | ASPHALT-TACK | M | 5.00 | .00 | GALLON |
| 5080 | BASE MATERIAL | M | 15.00 | .00 | CU YD |
| 5090 | CEMENT | M | 9.00 | .00 | BAG |
| 5110 | CHEMICAL-WEED | M | 7.00 | .00 | GALLON |
| 5140 | CONCRETE-REDIMX | M | 70.00 | .00 | CU YD |
| 5150 | CRACK SEALANT | M | 15.00 | .00 | GALLON |
| 5160 | CURING CMPD | M | 20.00 | .00 | GALLON |
| 5170 | DUST PALLIATVS | M | 5.00 | .00 | POUND |
| 5180 | EPOXY MIX | M | 45.00 | .00 | GALLON |
| 5190 | FENCE HARDWARE | M | 1.00 | .00 | DOLLAR |
| 5220 | FENCING | M | 1.25 | .00 | SQ FT |
| 5230 | FERTILIZER | M | 1.00 | .00 | POUNDS |
| 5250 | GRASS SEED | M | 2.00 | .00 | POUND |
| 5310 | JOINT FILLER | M | 12.00 | .00 | GALLON |
| 5320 | LAMPS, ROADWAY | M | 50.00 | .00 | EACH |
| 5330 | LIME | M | .50 | .00 | POUND |
| 5340 | LUMINAIRIES | M | 25.00 | .00 | EACH |
| 5350 | OTHER ELECTRICA | M | 1.00 | .00 | DOLLAR |
| 5360 | PLAS LITTER BGS | M | 3.00 | .00 | BOX(100) |
| 5370 | SIGN POST-MTL | M | 20.00 | .00 | EACH |
| 5380 | SIGN POST-WOOD | M | 15.00 | .00 | EACH |

| CODE | NAME | TYPE | COST | INVENTORY | AVAIL/UNITS |
|---|---|---|---|---|---|
| 5430 | SAND | M | 7.00 | .00 | CU YD |
| 5440 | SIGNS-TRAFFIC | M | 40.00 | .00 | EACH |
| 5520 | PAINT TRFC-YLLW | M | 20.00 | .00 | GALLON |
| 5530 | PAINT TRFC-WHT | M | 20.00 | .00 | GALLON |
| 5600 | MISC ROAD MTL | M | 1.00 | .00 | DOLLAR |
| 5610 | MISC GRND MTL | M | 1.00 | .00 | DOLLAR |
| 5620 | MISC TRAFFIC MT | M | 1.00 | .00 | DOLLAR |
| 5630 | MISC RR MTL | M | 1.00 | .00 | DOLLAR |
| 6000 | AUTOMOTIVE MTL | M | 1.00 | .00 | DOLLAR |
| 9000 | CONTRACT | M | 1.00 | .00 | DOLLAR |
| 9999 | LABOR 1 | L | 10.00 | 2.00 | |

DeLEUW, CATHER & Co. WORK PROGRAM AND BUDGET REPORT ¶Page: 1
Work Management System Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

| CODE | ACTIVITY NAME | FEATURE INVENTORY QUANTITY | UNIT | PLANNED SERVICE LEVEL | PCT OF DES | ANNUAL WORK QUANTITY | AVG DAILY PROD | CR SZ | PERSON DAYS | COST DISTRIBUTION LABOR | EQUIP | MAT/OTH | TOTAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT | 260.0 | MILES | 1.92 PER HR | 38 | 499 | 30.0 | 3 | 49 | 5666 | 1071 | 2490 | 9227 |
| 1395 | GEN CONC PVT RPR | 200.0 | K SQ YDS | 1.24 PER HRS | 82 | 248 | 20.0 | 2 | 24 | 2389 | 186 | 7750 | 10325 |
| 1510 | BLADE UNPVD SURFCS | 300.0 | MILES | 2.50 ROAD MI | 100 | 750 | 9.0 | 2 | 124 | 16793 | 12928 | 0 | 29721 |
| 1520 | STAB UNPVD SRFC | 300.0 | MILES | .15 ROAD MI | 60 | 45 | 4.0 | 4 | 45 | 5754 | 3876 | 3390 | 13020 |
| 1540 | DUST CONTROL | 300.0 | MILES | .30 ROAD MI | 60 | 90 | 6.0 | 1 | 15 | 1590 | 998 | 1875 | 4463 |
| 1730 | BLADE UNPVD SHLDRS | 1000.0 | MILES | 2.00 SHLDR MI | 66 | 2000 | 20.0 | 1 | 100 | 14860 | 12050 | 0 | 26910 |
| 1820 | MAINT RR SWITCH | 10.0 | EA | 10.00 SWITCH | 83 | 100 | 3.0 | 2 | 66 | 6474 | 500 | 999 | 7973 |
| 1830 | REPAIR RR TRACK | 35.0 | MILES | .71 MILE | 71 | 25 | .5 | 2 | 99 | 9662 | 746 | 994 | 11402 |
| 2110 | ROADWAY SWEEPING | 260.0 | MILES | 2.00 ROAD MI | 50 | 520 | 12.0 | 2 | 64 | 8729 | 3642 | 0 | 12371 |
| 2120 | RUNWAY SWEEPING | 150.0 | K SQ YDS | 15.00 K SQ YD | 75 | 2250 | 150.0 | 1 | 15 | 1590 | 908 | 0 | 2498 |
| 2140 | MACHINE MOWING | 400.0 | ACRES | 4.00 ACRES | 80 | 1600 | 15.0 | 1 | 106 | 11310 | 2134 | 0 | 13444 |
| 2150 | HAND MOWING TRIMMING | 400.0 | ACRES | 1.25 PER HRS | 62 | 500 | 20.0 | 2 | 50 | 4335 | 2075 | 0 | 6410 |
| 2151 | LAWN MOWING | 150.0 | ACRE | 9.60 ACRES | 80 | 1440 | 10.0 | 2 | 288 | 24970 | 11952 | 0 | 36922 |
| 2160 | SPRAYING/WEED CONTRL | 400.0 | ACRES | .75 PER HRS | 75 | 300 | 10.0 | 1 | 30 | 3180 | 600 | 4200 | 7980 |
| 2210 | REPAIR FENCES | 10000.0 | LIN FT | .30 LIN FT | 75 | 3000 | 300.0 | 3 | 30 | 2794 | 355 | 2250 | 5399 |
| 2230 | REMOVE RDWY DEBRIS | 760.0 | MILE | 1.92 PER HRS | 96 | 1459 | 30.0 | 3 | 145 | 16587 | 6041 | 0 | 22628 |
| 2290 | GEN GROUNDS MAINT | 400.0 | ACRES | .75 PER HRS | 75 | 300 | 20.0 | 2 | 30 | 2891 | 225 | 300 | 3416 |
| 3190 | GEN DRAINAGE MAINT | 1.0 | EA | 200.00 PER HR | 100 | 200 | 20.0 | 2 | 20 | 1927 | 355 | 300 | 2582 |
| 5120 | REPAIR SIGNS | 300.0 | EA | .25 signs | 83 | 75 | 5.0 | 2 | 30 | 2891 | 225 | 1200 | 4316 |
| 5190 | GEN TRAFFIC SRVC MNT | 1.0 | EA | 125.00 PER HRS | 83 | 125 | 20.0 | 2 | 12 | 1214 | 95 | 315 | 1624 |
| 6290 | GEN SNOW/ICE CONTROL | 1.0 | EA | 150.00 PER HRS | 100 | 150 | 30.0 | 3 | 15 | 1707 | 780 | 350 | 2837 |
| 7110 | HAUL TRASH/GARBAGE | 2.0 | EA | 150.00 TRUCK LD | 75 | 300 | 3.0 | 1 | 100 | 14860 | 12000 | 0 | 26860 |
| 7120 | MAINTAIN LANDFILL | 40.0 | ACRE | 6.00 PER HRS | 100 | 240 | 10.0 | 1 | 24 | 3566 | 7877 | 0 | 11443 |
| 9100 | SUPERVISION | 1.0 | EA | 1500.00 PER HR | 100 | 1500 | 10.0 | 1 | 150 | 22530 | 2250 | 0 | 24780 |
| 9200 | ADMIN/LV/TRNG | 1.0 | EA | 4000.00 PER HR | 100 | 4000 | 120.0 | 12 | 399 | 45571 | 0 | 0 | 45571 |

| | | | | |
|---|---|---|---|---|
| TOTALS: | 2037 | 233840 | 83869 | 26413 |
| | | OVERHEAD | .0% OF LABOR | |
| | | OVERHEAD | .0% OF TOTAL | |
| | | | TOTAL BUDGET | |

DeLEUW, CATHER & Co. DEFERRED BUDGET ¶Page: 1

Work Management System Date: 09/19/88

SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

| ACTIVITY CODE | ACTIVITY NAME | FEATURE INVENTORY QUANTITY | UNIT | DESIRED PROGRAM ANNUAL WORK QTY | COST | PLANNED PROGRAM ANNUAL WORK QTY | COST | PCT | DEFERRED BUDGET ANNUAL WORK QTY | COST | PCT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT | 260.0 | MILES | 1300.00 PER HR | 24066 | 499.20 PER HR | 9227 | 38 | 800.80 PER HR | 14839 | 62 |
| 1395 | GEN CONC PVT RPR | 200.0 | K SQ YDS | 300.00 PER HRS | 12491 | 248.00 PER HRS | 10325 | 82 | 52.00 PER HRS | 2166 | 18 |
| 1510 | BLADE UNPVD SURFCS | 300.0 | MILES | 750.00 ROAD MI | 29721 | 750.00 ROAD MI | 29721 | 100 | 0.00 ROAD MI | 0 | 0 |
| 1520 | STAB UNPVD SRFC | 300.0 | MILES | 75.00 ROAD MI | 21661 | 45.00 ROAD MI | 13020 | 60 | 30.00 ROAD MI | 8641 | 40 |
| 1540 | DUST CONTROL | 300.0 | MILES | 150.00 ROAD MI | 7438 | 90.00 ROAD MI | 4463 | 60 | 60.00 ROAD MI | 2975 | 40 |
| 1730 | BLADE UNPVD SHLDRS | 1000.0 | MILES | 3000.00 SHLDR MI | 40365 | 2000.00 SHLDR MI | 26910 | 66 | 1000.00 SHLDR MI | 13455 | 34 |
| 1820 | MAINT RR SWITCH | 10.0 | EA | 120.00 SWITCH | 9576 | 100.00 SWITCH | 7973 | 83 | 20.00 SWITCH | 1603 | 17 |
| 1830 | REPAIR RR TRACK | 35.0 | MILES | 35.00 MILE | 16058 | 24.85 MILE | 11402 | 71 | 10.15 MILE | 4656 | 29 |
| 2110 | ROADWAY SWEEPING | 260.0 | MILES | 1040.00 ROAD MI | 24770 | 520.00 ROAD MI | 12371 | 50 | 520.00 ROAD MI | 12399 | 50 |
| 2120 | RUNWAY SWEEPING | 150.0 | K SQ YDS | 3000.00 K SQ YD | 3330 | 2250.00 K SQ YD | 2498 | 75 | 750.00 K SQ YD | 832 | 25 |
| 2140 | MACHINE MOWING | 400.0 | ACRES | 2000.00 ACRES | 16796 | 1600.00 ACRES | 13444 | 80 | 400.00 ACRES | 3352 | 20 |
| 2150 | HAND MOWING TRIMMIN | 400.0 | ACRES | 800.00 PER HRS | 10256 | 500.00 PER HRS | 6410 | 62 | 300.00 PER HRS | 3846 | 38 |
| 2151 | LAWN MOWING | 150.0 | ACRE | 1800.00 ACRES | 46152 | 1440.00 ACRES | 36922 | 80 | 360.00 ACRES | 9230 | 20 |
| 2160 | SPRAYING/WEED CONTR | 400.0 | ACRES | 400.00 PER HRS | 10640 | 300.00 PER HRS | 7980 | 75 | 100.00 PER HRS | 2660 | 25 |
| 2210 | REPAIR FENCES | 10000.0 | LIN FT | 4000.00 LIN FT | 7181 | 3000.00 LIN FT | 5399 | 75 | 1000.00 LIN FT | 1782 | 25 |
| 2230 | REMOVE RDWY DEBRIS | 760.0 | MILE | 1520.00 PER HRS | 23606 | 1459.20 PER HRS | 22628 | 96 | 60.80 PER HRS | 978 | 4 |
| 2290 | GEN GROUNDS MAINT | 400.0 | ACRES | 400.00 PER HRS | 4554 | 300.00 PER HRS | 3416 | 75 | 100.00 PER HRS | 1138 | 25 |
| 3190 | GEN DRAINAGE MAINT | 1.0 | EA | 200.00 PER HR | 2582 | 200.00 PER HR | 2582 | 100 | 0.00 PER HR | 0 | 0 |
| 5120 | REPAIR SIGNS | 300.0 | EA | 90.00 signs | 5179 | 75.00 signs | 4316 | 83 | 15.00 signs | 863 | 17 |
| 5190 | GEN TRAFFIC SRVC MN | 1.0 | EA | 150.00 PER HRS | 1933 | 125.00 PER HRS | 1624 | 83 | 25.00 PER HRS | 309 | 17 |
| 6290 | GEN SNOW/ICE CONTRO | 1.0 | EA | 150.00 PER HRS | 2837 | 150.00 PER HRS | 2837 | 100 | 0.00 PER HRS | 0 | 0 |
| 7110 | HAUL TRASH/GARBAGE | 2.0 | EA | 400.00 TRUCK LD | 35804 | 300.00 [illegible] | 26860 | 75 | 100.00 TRUCK LD | 8944 | 25 |
| 7120 | MAINTAIN LANDFILL | 40.0 | ACRE | 240.00 PER HRS | 11443 | 240.00 PER HRS | 11443 | 100 | 0.00 PER HRS | 0 | 0 |
| 9100 | SUPERVISION | 1.0 | EA | 1500.00 PER HR | 24780 | 1500.00 PER HR | 24780 | 100 | 0.00 PER HR | 0 | 0 |
| 9200 | ADMIN/LV/TRNG | 1.0 | EA | 4000.00 PER HR | 45571 | 4000.00 PER HR | 45571 | 100 | 0.00 PER HR | 0 | 0 |
| | | | | TOTALS: | 438790 | | 344122 | 78 | | 94668 | 21 |

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Work Management System Date: 09/19/88

SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

| RESOURCE CODE | NAME | PERSON DAYS BY MONTH OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | TOTAL NEED | TOTAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1110 | MNT GEN FRMN-EW | INVENTORY: | | 1.00 | AVAILABILITY | | 100 | | | | | | | | |
| | PERSON DAYS REQUIRED: | 15.3 | 15.3 | 15.3 | 15.5 | 15.5 | 15.4 | 15.4 | 15.2 | 15.1 | 15.1 | 15.1 | 15.1 | 183.3 | 27531 |
| | AVG NO STAFF REQUIRED: | 1.0 | 1.0 | .9 | .9 | 1.0 | .9 | 1.0 | .8 | .9 | 1.0 | .8 | .9 | .9 | 27531 |
| 1120 | ENG EQUIP OP | INVENTORY: | | 3.00 | AVAILABILITY | | 100 | | | | | | | | |
| | PERSON DAYS REQUIRED: | 45.4 | 45.5 | 45.4 | 46.3 | 46.1 | 45.6 | 47.2 | 45.5 | 45.1 | 44.0 | 43.6 | 43.6 | 543.3 | 80734 |
| | AVG NO STAFF REQUIRED: | 2.8 | 2.8 | 2.7 | 2.6 | 3.1 | 2.5 | 3.0 | 2.5 | 2.7 | 2.9 | 2.3 | 2.7 | 2.7 | 80734 |
| 1130 | MOT VEH OP | INVENTORY: | | 3.00 | AVAILABILITY | | 100 | | | | | | | | |
| | PERSON DAYS REQUIRED: | 42.4 | 30.5 | 30.3 | 30.7 | 30.2 | 43.3 | 47.3 | 48.6 | 48.3 | 46.8 | 46.4 | 46.4 | 491.3 | 52088 |
| | AVG NO STAFF REQUIRED: | 2.7 | 1.9 | 1.8 | 1.7 | 2.0 | 2.4 | 3.0 | 2.7 | 2.8 | 3.1 | 2.4 | 2.9 | 2.4 | 52088 |
| 1160 | LABORER | INVENTORY: | | 3.00 | AVAILABILITY | | 100 | | | | | | | | |
| | PERSON DAYS REQUIRED: | 57.5 | 25.6 | 26.0 | 26.0 | 25.6 | 57.2 | 66.1 | 64.6 | 60.3 | 59.3 | 59.3 | 59.3 | 586.8 | 50875 |
| | AVG NO STAFF REQUIRED: | 3.6 | 1.6 | 1.5 | 1.4 | 1.7 | 3.2 | 4.1 | 3.6 | 3.5 | 4.0 | 3.1 | 3.7 | 2.9 | 50875 |
| 1170 | PR MNT OP | INVENTORY: | | 2.00 | AVAILABILITY | | 100 | | | | | | | | |
| | PERSON DAYS REQUIRED: | 20.0 | 20.0 | 19.6 | 20.2 | 19.4 | 19.4 | 19.4 | 19.4 | 19.2 | 19.0 | 18.6 | 18.4 | 232.6 | 22608 |
| | AVG NO STAFF REQUIRED: | 1.3 | 1.3 | 1.2 | 1.1 | 1.3 | 1.1 | 1.2 | 1.1 | 1.1 | 1.3 | 1.0 | 1.2 | 1.1 | 22608 |

| RESOURCE CODE | NAME | EQUIPMENT HOURS BY MONTH OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | TOTAL NEED | TOTAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3010 | PICKUP-2WD | INVENTORY: | | 2.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 258.0 | 259.0 | 254.0 | 258.0 | 256.3 | 253.0 | 264.0 | 261.0 | 261.0 | 249.0 | 247.0 | 246.0 | 3066.3 | 4599 |
| | AVG UNITS REQUIRED: | 1.6 | 1.6 | 1.5 | 1.4 | 1.7 | 1.4 | 1.7 | 1.5 | 1.5 | 1.7 | 1.3 | 1.5 | 1.5 | 4599 |
| 3040 | DUMP TRUCKS-5YD | INVENTORY: | | 4.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 88.0 | 89.0 | 95.0 | 93.0 | 91.0 | 89.0 | 89.0 | 77.0 | 77.0 | 77.0 | 75.0 | 75.0 | 1015.0 | 3603 |
| | AVG UNITS REQUIRED: | .6 | .6 | .6 | .5 | .6 | .5 | .6 | .4 | .5 | .5 | .4 | .5 | .5 | 3603 |
| 3061 | GARBAGE TRUCK | INVENTORY: | | 1.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 83.0 | 83.0 | 83.0 | 85.0 | 85.0 | 85.0 | 84.0 | 83.0 | 83.0 | 82.0 | 82.0 | 82.0 | 1000.0 | 12000 |
| | AVG UNITS REQUIRED: | .5 | .5 | .5 | .5 | .6 | .5 | .5 | .5 | .5 | .5 | .4 | .5 | .4 | 12000 |
| 3090 | WATER DISTRIBUT | INVENTORY: | | 2.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 78.5 | 78.5 | 71.5 | 74.0 | 74.5 | 72.0 | 81.0 | 77.0 | 77.0 | 72.0 | 70.0 | 70.0 | 896.0 | 5958 |
| | AVG UNITS REQUIRED: | .5 | .5 | .4 | .4 | .5 | .4 | .5 | .4 | .5 | .5 | .4 | .4 | .4 | 5958 |
| 3210 | FRONT LOADER | INVENTORY: | | 1.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 42.0 | 42.0 | 42.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 40.0 | 486.0 | 4315 |
| | AVG UNITS REQUIRED: | .3 | .3 | .2 | .2 | .3 | .2 | .3 | .2 | .2 | .3 | .2 | .3 | .2 | 4315 |
| 3220 | ROAD GRADER | INVENTORY: | | 2.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 164.0 | 164.0 | 164.0 | 167.0 | 169.0 | 165.0 | 182.0 | 171.0 | 171.0 | 161.0 | 159.0 | 159.0 | 1996.0 | 24051 |
| | AVG UNITS REQUIRED: | 1.0 | 1.0 | 1.0 | .9 | 1.1 | .9 | 1.1 | 1.0 | 1.0 | 1.1 | .8 | 1.0 | .9 | 24051 |
| 3260 | TRACTOR MOWER | INVENTORY: | | 2.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 120.0 | .0 | .0 | .0 | .0 | 137.0 | 160.0 | 190.0 | 190.0 | 190.0 | 190.0 | 190.0 | 1367.0 | 2734 |
| | AVG UNITS REQUIRED: | .8 | .0 | .0 | .0 | .0 | .8 | 1.0 | 1.1 | 1.1 | 1.3 | 1.0 | 1.2 | .6 | 2734 |
| 3270 | ROLLER | INVENTORY: | | 1.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 11.0 | 11.0 | 11.0 | 11.0 | 10.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 7.0 | 7.0 | 113.0 | 1361 |
| | AVG UNITS REQUIRED: | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .0 | .0 | .0 | 1361 |
| 30 | STREET SWEEPER | INVENTORY: | | 1.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 18.5 | 18.5 | 18.5 | 19.0 | 19.0 | 19.0 | 19.0 | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 216.5 | 898 |
| | AVG UNITS REQUIRED: | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | 898 |
| 3282 | RUNWAY SWEEPER | INVENTORY: | | 1.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 150.0 | 907 |
| | AVG UNITS REQUIRED: | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .0 | 907 |
| 3283 | SWEEPER W/MAGNT | INVENTORY: | | 1.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 18.5 | 18.5 | 18.5 | 19.0 | 19.0 | 19.0 | 19.0 | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 216.5 | 1309 |
| | AVG UNITS REQUIRED: | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | 1309 |
| 3410 | SCRAPER | INVENTORY: | | 1.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 10.0 | 10.0 | 10.0 | 10.5 | 10.5 | 10.5 | 10.5 | 10.0 | 9.5 | 9.5 | 9.5 | 9.5 | 120.0 | 4752 |
| | AVG UNITS REQUIRED: | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .0 | 4752 |
| 3420 | BULLDOZER | INVENTORY: | | 1.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 10.0 | 10.0 | 10.0 | 10.5 | 10.5 | 10.5 | 10.5 | 10.0 | 9.5 | 9.5 | 9.5 | 9.5 | 120.0 | 3126 |
| | AVG UNITS REQUIRED: | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .0 | 3126 |

| CODE | RESOURCE NAME | | EQUIPMENT HOURS BY MONTH | | | | | | | | | | TOTAL NEED | TOTAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | | |
| 4180 | RIDING MOWERS | INVENTORY: | | 2.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 360.0 | 40.0 | 42.0 | 42.0 | 42.0 | 362.0 | 442.0 | 442.0 | 402.0 | 402.0 | 402.0 | 402.0 | 3380.0 | 14027 |
| | AVG UNITS REQUIRED: | 2.3 | .3 | .2 | .2 | .3 | 2.0 | 2.8 | 2.5 | 2.4 | 2.7 | 2.1 | 2.5 | 1.6 | 14027 |
| 4250 | VIBRATORY TAMP | INVENTORY: | | 1.00 | AVAILABILITY | | 100 | | | | | | | | |
| | EQUIP HOURS REQUIRED: | 13.0 | 14.0 | 13.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 166.0 | 232 |
| | AVG UNITS REQUIRED: | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .0 | 232 |

| RESOURCE CODE | RESOURCE NAME | MATERIAL/OTHER REQUIREMENTS BY MONTH OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | TOTAL NEED | TOTAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5080 | BASE MATERIAL CU YD | 22.0 | 22.0 | 22.0 | 22.0 | 20.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 14.0 | 14.0 | 226.0 | 3390 |
| 5110 | CHEMICAL-WEED GALLON | 60.0 | .0 | .0 | .0 | .0 | 60.0 | 80.0 | 80.0 | 80.0 | 80.0 | 80.0 | 80.0 | 600.0 | 4200 |
| 5140 | CONCRETE-REDIMX CU YD | 7.2 | 7.2 | 7.2 | 7.2 | 7.2 | 6.0 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 74.4 | 5208 |
| 5170 | DUST PALLIATVS POUND | 35.0 | 35.0 | 30.0 | 35.0 | 35.0 | 35.0 | 32.5 | 27.5 | 27.5 | 27.5 | 27.5 | 27.5 | 375.0 | 1875 |
| 5180 | EPOXY MIX GALLON | 4.8 | 4.8 | 4.8 | 4.8 | 4.8 | 4.0 | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 | 49.6 | 2232 |
| 5190 | FENCE HARDWARE DOLLAR | 130.0 | 130.0 | 100.0 | 90.0 | 90.0 | 80.0 | 80.0 | 60.0 | 60.0 | 60.0 | 60.0 | 60.0 | 1000.0 | 1000 |
| 5220 | FENCING SQ FT | 130.0 | 130.0 | 100.0 | 90.0 | 90.0 | 80.0 | 80.0 | 60.0 | 60.0 | 60.0 | 60.0 | 60.0 | 1000.0 | 1250 |
| 5430 | SAND CU YD | .0 | .0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | .0 | .0 | .0 | .0 | .0 | 50.0 | 350 |
| 5440 | SIGNS-TRAFFIC EACH | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 4.0 | 4.0 | 2.0 | 2.0 | 2.0 | 30.0 | 1200 |
| 5600 | MISC ROAD MTL DOLLAR | 252.0 | 267.0 | 252.0 | 267.0 | 264.0 | 259.0 | 256.5 | 256.5 | 256.5 | 256.5 | 256.5 | 256.5 | 3100.0 | 3100 |
| 5610 | MISC GRND MTL DOLLAR | 26.0 | 26.0 | 24.0 | 26.0 | 26.0 | 26.0 | 26.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 300.0 | 300 |
| 5620 | MISC TRAFFIC MT DOLLAR | 30.0 | 30.0 | 30.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 315.0 | 315 |
| 5630 | MISC RR MTL DOLLAR | 174.0 | 174.0 | 170.0 | 174.0 | 165.0 | 165.0 | 165.0 | 165.0 | 165.0 | 162.0 | 158.0 | 156.0 | 1993.0 | 1993 |

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Work Management System Date: 09/19/88

SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

| CODE | ACTIVITY NAME | PERSON DAYS PER MONTH OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | TOTAL | CR SZ | CREW DAYS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT | 3.9 | 4.2 | 3.9 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 49.8 | 3 | 16.6 |
| 1395 | GEN CONC PVT RPR | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.0 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 24.8 | 2 | 12.4 |
| 1510 | BLADE UNPVD SURFCS | 10.5 | 10.5 | 9.0 | 9.0 | 9.5 | 9.0 | 12.0 | 12.0 | 12.0 | 10.5 | 10.5 | 10.5 | 125.0 | 2 | 83.3 |
| 1520 | STAB UNPVD SRFC | 4.4 | 4.4 | 4.4 | 4.4 | 4.0 | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 | 2.8 | 2.8 | 45.2 | 4 | 11.3 |
| 1540 | DUST CONTROL | 1.4 | 1.4 | 1.2 | 1.4 | 1.4 | 1.4 | 1.3 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 15.0 | 1 | 15.0 |
| 1730 | BLADE UNPVD SHLDRS | 8.3 | 8.3 | 8.3 | 8.6 | 8.6 | 8.6 | 8.3 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 100.0 | 1 | 100.0 |
| 1820 | MAINT RR SWITCH | 6.0 | 6.0 | 6.0 | 6.0 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.2 | 5.2 | 5.2 | 66.6 | 2 | 33.3 |
| 1830 | REPAIR RR TRACK | 8.4 | 8.4 | 8.0 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.0 | 7.8 | 99.4 | 2 | 49.7 |
| 2110 | ROADWAY SWEEPING | 5.6 | 5.6 | 5.6 | 5.7 | 5.7 | 5.7 | 5.7 | 5.1 | 5.1 | 5.1 | 5.1 | 5.1 | 65.1 | 2 | 43.3 |
| 2120 | RUNWAY SWEEPING | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 15.0 | 1 | 15.0 |
| 2140 | MACHINE MOWING | 9.0 | | | | | 10.7 | 12.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 106.7 | 1 | 106.7 |
| 2150 | HAND MOWING TRIMMING | 4.0 | 4.0 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 50.0 | 2 | 25.0 |
| 2151 | LAWN MOWING | 32.0 | | | | | 32.0 | 40.0 | 40.0 | 36.0 | 36.0 | 36.0 | 36.0 | 288.0 | 2 | 144.0 |
| 2160 | SPRAYING/WEED CONTRL | 3.0 | | | | | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 30.0 | 1 | 30.0 |
| 2210 | REPAIR FENCES | 3.9 | 3.9 | 3.0 | 2.7 | 2.7 | 2.4 | 2.4 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 30.0 | 3 | 10.0 |
| 2230 | REMOVE RDWY DEBRIS | 12.6 | 12.6 | 12.6 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 145.8 | 3 | 48.6 |
| 2290 | GEN GROUNDS MAINT | 2.6 | 2.6 | 2.4 | 2.6 | 2.6 | 2.6 | 2.6 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 30.0 | 2 | 15.0 |
| 3190 | GEN DRAINAGE MAINT | 1.8 | 1.8 | 1.8 | 1.8 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 20.0 | 2 | 10.0 |
| 5120 | REPAIR SIGNS | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 4.0 | 4.0 | 2.0 | 2.0 | 2.0 | 30.0 | 2 | 15.0 |
| 5190 | GEN TRAFFIC SRVC MNT | 1.2 | 1.2 | 1.2 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.6 | 2 | 6.3 |
| 6290 | GEN SNOW/ICE CONTROL | | | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | | | | | | 15.0 | 3 | 5.0 |
| 7110 | HAUL TRASH/GARBAGE | 8.3 | 8.3 | 8.3 | 8.5 | 8.5 | 8.5 | 8.4 | 8.3 | 8.3 | 8.2 | 8.2 | 8.2 | 100.0 | 1 | 100.0 |
| 7120 | MAINTAIN LANDFILL | 2.0 | 2.0 | 2.0 | 2.1 | 2.1 | 2.1 | 2.1 | 2.0 | 1.9 | 1.9 | 1.9 | 1.9 | 24.0 | 1 | 24.0 |
| 9100 | SUPERVISION | 12.5 | 12.5 | 12.5 | 12.6 | 12.7 | 12.6 | 12.6 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 150.0 | 1 | 150.0 |
| 9200 | ADMIN/LV/TRNG | 33.6 | 33.6 | 33.6 | 34.8 | 33.6 | 33.6 | 33.6 | 33.6 | 32.4 | 32.4 | 32.4 | 32.4 | 399.6 | 12 | 33.3 |

| ACTIVITY CODE | NAME/ANNUAL WORK QTY | CR SZ | CREW DAYS - PLANNED OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | ANNUAL TOTAL | AVG DAILY PRODUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT<br>499 PER HR | 3 | 1.3 | 1.4 | 1.3 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 16.6 | 30.0 |
| 1395 | GEN CONC PVT RPR<br>248 PER HRS | 2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.0 | .9 | .9 | .9 | .9 | .9 | .9 | 12.4 | 20.0 |
| 1510 | BLADE UNPVD SURFCS<br>750 ROAD MI | 2 | 7.0 | 7.0 | 6.0 | 6.0 | 6.3 | 6.0 | 8.0 | 8.0 | 8.0 | 7.0 | 7.0 | 7.0 | 83.3 | 9.0 |
| 1520 | STAB UNPVD SRFC<br>45 ROAD MI | 4 | 1.1 | 1.1 | 1.1 | 1.1 | 1.0 | .9 | .9 | .9 | .9 | .9 | .7 | .7 | 11.3 | 4.0 |
| 1540 | DUST CONTROL<br>90 ROAD MI | 1 | 1.4 | 1.4 | 1.2 | 1.4 | 1.4 | 1.4 | 1.3 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 15.0 | 6.0 |
| 1730 | BLADE UNPVD SHLDRS<br>2000 SHLDR MI | 1 | 8.3 | 8.3 | 8.3 | 8.6 | 8.6 | 8.6 | 8.3 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 100.0 | 20.0 |
| 1820 | MAINT RR SWITCH<br>100 SWITCH | 2 | 3.0 | 3.0 | 3.0 | 3.0 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.6 | 2.6 | 2.6 | 33.3 | 3.0 |
| 1830 | REPAIR RR TRACK<br>25 MILE | 2 | 4.2 | 4.2 | 4.0 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.0 | 3.9 | 49.7 | .5 |
| 2110 | ROADWAY SWEEPING<br>520 ROAD MI | 2 | 3.7 | 3.7 | 3.7 | 3.8 | 3.8 | 3.8 | 3.8 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 43.3 | 12.0 |
| 2120 | RUNWAY SWEEPING<br>2250 K SQ YD | 1 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 15.0 | 150.0 |
| 2140 | MACHINE MOWING<br>1600 ACRES | 1 | 9.0 | .0 | .0 | .0 | .0 | 10.7 | 12.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 106.7 | 15.0 |
| 2150 | HAND MOWING TRIMMING<br>500 PER HRS | 2 | 2.0 | 2.0 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 25.0 | 20.0 |
| 2151 | LAWN MOWING<br>1440 ACRES | 2 | 16.0 | .0 | .0 | .0 | .0 | 16.0 | 20.0 | 20.0 | 18.0 | 18.0 | 18.0 | 18.0 | 144.0 | 10.0 |
| 2160 | SPRAYING/WEED CONTRL<br>300 PER HRS | 1 | 3.0 | .0 | .0 | .0 | .0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 30.0 | 10.0 |
| 2210 | REPAIR FENCES<br>3000 LIN FT | 3 | 1.3 | 1.3 | 1.0 | .9 | .9 | .8 | .8 | .6 | .6 | .6 | .6 | .6 | 10.0 | 300.0 |
| 2230 | REMOVE RDWY DEBRIS<br>1459 PER HRS | 3 | 4.2 | 4.2 | 4.2 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.6 | 30.0 |
| 2290 | GEN GROUNDS MAINT<br>300 PER HRS | 2 | 1.3 | 1.3 | 1.2 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 15.0 | 20.0 |
| 3190 | GEN DRAINAGE MAINT<br>200 PER HR | 2 | .9 | .9 | .9 | .9 | .8 | .8 | .8 | .8 | .8 | .8 | .8 | .8 | 10.0 | 20.0 |
| 5120 | REPAIR SIGNS<br>75 signs | 2 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 1.0 | 1.0 | 1.0 | 15.0 | 5.0 |
| 5190 | GEN TRAFFIC SRVC MNT<br>125 PER HRS | 2 | .6 | .6 | .6 | .5 | .5 | .5 | .5 | .5 | .5 | .5 | .5 | .5 | 6.3 | 20.0 |
| 6290 | GEN SNOW/ICE CONTROL<br>150 PER HRS | 3 | .0 | .0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | .0 | .0 | .0 | .0 | .0 | 5.0 | 30.0 |
| 7110 | HAUL TRASH/GARBAGE<br>300 TRUCK LD | 1 | 8.3 | 8.3 | 8.3 | 8.5 | 8.5 | 8.5 | 8.4 | 8.3 | 8.3 | 8.2 | 8.2 | 8.2 | 100.0 | 3.0 |
| 7120 | MAINTAIN LANDFILL<br>240 PER HRS | 1 | 2.0 | 2.0 | 2.0 | 2.1 | 2.1 | 2.1 | 2.1 | 2.0 | 1.9 | 1.9 | 1.9 | 1.9 | 24.0 | 10.0 |
| 9100 | SUPERVISION<br>1500 PER HR | 1 | 12.5 | 12.5 | 12.5 | 12.6 | 12.7 | 12.6 | 12.6 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 150.0 | 10.0 |
| 9200 | ADMIN/LV/TRNG<br>4000 PER HR | 12 | 2.8 | 2.8 | 2.8 | 2.9 | 2.8 | 2.8 | 2.8 | 2.8 | 2.7 | 2.7 | 2.7 | 2.7 | 33.3 | 120.0 |

DeLEUW, CATHER & Co. PERFORMANCE REPORT ¶Page: 1
Work Management System Period from 10/01/87 TO 04/30/88 Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Mgmt Unit: ROAD ROADS & GROUNDS BRANCH

| CODE | ACTIVITY NAME | PERFORMANCE INDICATOR | CURRENT MONTH PERFORMANCE PLAN | ACTUAL | PCT | YEAR TO DATE PERFORMANCE PLAN | ACTUAL | PCT |
|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT | Person Days | 4 | 12 | 300 | 29 | 28 | 97 |
| | PER HR | Accomplishment | 42.0 | 120.0 | 286 | 288.0 | 280.0 | 97 |
| | | Avg Daily Prod | 30.0 | 30.0 | 100 | 30.0 | 30.0 | 100 |
| | | Total Cost | 778 | 2223 | 286 | 5335 | 5335 | 100 |
| | | Unit Cost ($) | 18.52 | 18.53 | 100 | 18.52 | 19.05 | 103 |
| 1395 | GEN CONC PVT RPR | Person Days | 2 | 16 | 800 | 16 | 16 | 100 |
| | PER HRS | Accomplishment | 18.0 | 160.0 | 889 | 158.0 | 160.0 | 101 |
| | | Avg Daily Prod | 20.0 | 20.0 | 100 | 20.0 | 20.0 | 100 |
| | | Total Cost | 750 | 4672 | 623 | 6579 | 4672 | 71 |
| | | Unit Cost ($) | 41.67 | 29.20 | 70 | 41.64 | 29.20 | 70 |
| 1510 | BLADE UNPVD SURFCS | Person Days | 12 | 6 | 50 | 69 | 24 | 35 |
| | ROAD MI | Accomplishment | 72.0 | 35.0 | 49 | 416.7 | 145.0 | 35 |
| | | Avg Daily Prod | 9.0 | 8.8 | 98 | 9.0 | 9.1 | 101 |
| | | Total Cost | 2855 | 1481 | 52 | 16520 | 5443 | 33 |
| | | Unit Cost ($) | 39.65 | 42.31 | 107 | 39.64 | 37.54 | 95 |
| 1520 | STAB UNPVD SRFC | Person Days | 4 | 0 | 0 | 29 | 0 | 0 |
| | ROAD MI | Accomplishment | 3.6 | .0 | 0 | 28.8 | .0 | 0 |
| | | Avg Daily Prod | 4.0 | .0 | 0 | 4.0 | .0 | 0 |
| | | Total Cost | 1037 | 0 | 0 | 8296 | 0 | 0 |
| | | Unit Cost ($) | 288.06 | .00 | 0 | 288.06 | .00 | 0 |
| 1540 | DUST CONTROL | Person Days | 1 | 0 | 0 | 10 | 0 | 0 |
| | ROAD MI | Accomplishment | 7.8 | .0 | 0 | 57.0 | .0 | 0 |
| | | Avg Daily Prod | 6.0 | .0 | 0 | 6.0 | .0 | 0 |
| | | Total Cost | 387 | 0 | 0 | 2827 | 0 | 0 |
| | | Unit Cost ($) | 49.62 | .00 | 0 | 49.60 | .00 | 0 |
| 1730 | BLADE UNPVD SHLDRS | Person Days | 8 | 4 | 50 | 59 | 14 | 24 |
| | SHLDR MI | Accomplishment | 166.0 | 70.0 | 42 | 1180.0 | 225.0 | 19 |
| | | Avg Daily Prod | 20.0 | 17.5 | 88 | 20.0 | 16.1 | 81 |
| | | Total Cost | 2233 | 1076 | 48 | 15877 | 3767 | 24 |
| | | Unit Cost ($) | 13.45 | 15.37 | 114 | 13.46 | 16.74 | 124 |
| 1820 | MAINT RR SWITCH | Person Days | 5 | 0 | 0 | 40 | 0 | 0 |
| | SWITCH | Accomplishment | 8.1 | .0 | 0 | 60.3 | .0 | 0 |
| | | Avg Daily Prod | 3.0 | .0 | 0 | 3.0 | .0 | 0 |
| | | Total Cost | 647 | 0 | 0 | 4812 | 0 | 0 |
| | | Unit Cost ($) | 79.88 | .00 | 0 | 79.80 | .00 | 0 |
| 1830 | REPAIR RR TRACK | Person Days | 8 | 0 | 0 | 58 | 0 | 0 |
| | MILE | Accomplishment | 2.1 | .0 | 0 | 14.6 | .0 | 0 |
| | | Avg Daily Prod | .5 | .0 | 0 | .5 | .0 | 0 |
| | | Total Cost | 963 | 0 | 0 | 6698 | 0 | 0 |
| | | Unit Cost ($) | 458.57 | .00 | 0 | 458.77 | .00 | 0 |

| CODE | ACTIVITY NAME | PERFORMANCE INDICATOR | CURRENT MONTH PERFORMANCE PLAN | ACTUAL | PCT | YEAR TO DATE PERFORMANCE PLAN | ACTUAL | PCT |
|---|---|---|---|---|---|---|---|---|
| 2110 | ROADWAY SWEEPING | Person Days | 6 | 0 | 0 | 39 | 7 | 18 |
| | ROAD MI | Accomplishment | 45.6 | .0 | 0 | 315.6 | 60.0 | 19 |
| | | Avg Daily Prod | 12.0 | .0 | 0 | 12.0 | 12.9 | 108 |
| | | Total Cost | 1086 | 0 | 0 | 7514 | 1078 | 14 |
| | | Unit Cost ($) | 23.82 | .00 | 0 | 23.81 | 17.97 | 75 |
| 2120 | RUNWAY SWEEPING | Person Days | 1 | 0 | 0 | 9 | 0 | 0 |
| | K SQ YD | Accomplishment | 180.0 | .0 | 0 | 1350.0 | .0 | 0 |
| | | Avg Daily Prod | 150.0 | .0 | 0 | 150.0 | .0 | 0 |
| | | Total Cost | 200 | 0 | 0 | 1499 | 0 | 0 |
| | | Unit Cost ($) | 1.11 | .00 | 0 | 1.11 | .00 | 0 |
| 2140 | MACHINE MOWING | Person Days | 12 | 8 | 67 | 32 | 16 | 50 |
| | ACRES | Accomplishment | 180.0 | 130.0 | 72 | 475.5 | 260.0 | 55 |
| | | Avg Daily Prod | 15.0 | 16.3 | 109 | 15.0 | 16.3 | 109 |
| | | Total Cost | 1512 | 1008 | 67 | 3994 | 2016 | 50 |
| | | Unit Cost ($) | 8.40 | 7.75 | 92 | 8.40 | 7.75 | 92 |
| 2150 | HAND MOWING TRIMMING | Person Days | 4 | 0 | 0 | 29 | 0 | 0 |
| | PER HRS | Accomplishment | 42.0 | .0 | 0 | 290.0 | .0 | 0 |
| | | Avg Daily Prod | 20.0 | .0 | 0 | 20.0 | .0 | 0 |
| | | Total Cost | 538 | 0 | 0 | 3718 | 0 | 0 |
| | | Unit Cost ($) | 12.81 | .00 | 0 | 12.82 | .00 | 0 |
| 2151 | LAWN MOWING | Person Days | 40 | 0 | 0 | 104 | 0 | 0 |
| | ACRES | Accomplishment | 200.0 | .0 | 0 | 520.0 | .0 | 0 |
| | | Avg Daily Prod | 10.0 | .0 | 0 | 10.0 | .0 | 0 |
| | | Total Cost | 5128 | 0 | 0 | 13333 | 0 | 0 |
| | | Unit Cost ($) | 25.64 | .00 | 0 | 25.64 | .00 | 0 |
| 2160 | SPRAYING/WEED CONTRL | Person Days | 4 | 0 | 0 | 10 | 0 | 0 |
| | PER HRS | Accomplishment | 40.0 | .0 | 0 | 100.0 | .0 | 0 |
| | | Avg Daily Prod | 10.0 | .0 | 0 | 10.0 | .0 | 0 |
| | | Total Cost | 1064 | 0 | 0 | 2660 | 0 | 0 |
| | | Unit Cost ($) | 26.60 | .00 | 0 | 26.60 | .00 | 0 |
| 2210 | REPAIR FENCES | Person Days | 2 | 0 | 0 | 21 | 0 | 0 |
| | LIN FT | Accomplishment | 240.0 | .0 | 0 | 2100.0 | .0 | 0 |
| | | Avg Daily Prod | 300.0 | .0 | 0 | 300.0 | .0 | 0 |
| | | Total Cost | 432 | 0 | 0 | 3780 | 0 | 0 |
| | | Unit Cost ($) | 1.80 | .00 | 0 | 1.80 | .00 | 0 |
| 2230 | REMOVE RDWY DEBRIS | Person Days | 12 | 0 | 0 | 86 | 0 | 0 |
| | PER HRS | Accomplishment | 120.0 | .0 | 0 | 858.0 | .0 | 0 |
| | | Avg Daily Prod | 30.0 | .0 | 0 | 30.0 | .0 | 0 |
| | | Total Cost | 1862 | 0 | 0 | 13316 | 0 | 0 |
| | | Unit Cost ($) | 15.52 | .00 | 0 | 15.52 | .00 | 0 |

| ACTIVITY CODE | ACTIVITY NAME | PERFORMANCE INDICATOR | CURRENT MONTH PERFORMANCE PLAN | ACTUAL | PCT | YEAR TO DATE PERFORMANCE PLAN | ACTUAL | PCT |
|---|---|---|---|---|---|---|---|---|
| 2290 | GEN GROUNDS MAINT | Person Days | 3 | 0 | 0 | 18 | 0 | 0 |
| | PER HRS | Accomplishment | 26.0 | .0 | 0 | 180.0 | .0 | 0 |
| | | Avg Daily Prod | 20.0 | .0 | 0 | 20.0 | .0 | 0 |
| | | Total Cost | 297 | 0 | 0 | 2049 | 0 | 0 |
| | | Unit Cost ($) | 11.42 | .00 | 0 | 11.38 | .00 | 0 |
| 3190 | GEN DRAINAGE MAINT | Person Days | 2 | 0 | 0 | 12 | 0 | 0 |
| | PER HR | Accomplishment | 16.0 | .0 | 0 | 120.0 | .0 | 0 |
| | | Avg Daily Prod | 20.0 | .0 | 0 | 20.0 | .0 | 0 |
| | | Total Cost | 206 | 0 | 0 | 1549 | 0 | 0 |
| | | Unit Cost ($) | 12.88 | .00 | 0 | 12.91 | .00 | 0 |
| 5120 | REPAIR SIGNS | Person Days | 4 | 0 | 0 | 16 | 0 | 0 |
| | signs | Accomplishment | 10.0 | .0 | 0 | 40.0 | .0 | 0 |
| | | Avg Daily Prod | 5.0 | .0 | 0 | 5.0 | .0 | 0 |
| | | Total Cost | 575 | 0 | 0 | 2302 | 0 | 0 |
| | | Unit Cost ($) | 57.50 | .00 | 0 | 57.55 | .00 | 0 |
| 5190 | GEN TRAFFIC SRVC MNT | Person Days | 1 | 0 | 0 | 8 | 0 | 0 |
| | PER HRS | Accomplishment | 10.0 | .0 | 0 | 76.0 | .0 | 0 |
| | | Avg Daily Prod | 20.0 | .0 | 0 | 20.0 | .0 | 0 |
| | | Total Cost | 129 | 0 | 0 | 979 | 0 | 0 |
| | | Unit Cost ($) | 12.90 | .00 | 0 | 12.88 | .00 | 0 |
| 6290 | GEN SNOW/ICE CONTROL | Person Days | 3 | 0 | 0 | 15 | 59 | 393 |
| | PER HRS | Accomplishment | 30.0 | .0 | 0 | 150.0 | 590.0 | 393 |
| | | Avg Daily Prod | 30.0 | .0 | 0 | 30.0 | 30.0 | 100 |
| | | Total Cost | 567 | 0 | 0 | 2837 | 11286 | 398 |
| | | Unit Cost ($) | 18.90 | .00 | 0 | 18.91 | 19.13 | 101 |
| 7110 | HAUL TRASH/GARBAGE | Person Days | 8 | 0 | 0 | 59 | 0 | 0 |
| | TRUCK LD | Accomplishment | 25.2 | .0 | 0 | 176.4 | .0 | 0 |
| | | Avg Daily Prod | 3.0 | .0 | 0 | 3.0 | .0 | 0 |
| | | Total Cost | 2256 | 0 | 0 | 15794 | 0 | 0 |
| | | Unit Cost ($) | 89.52 | .00 | 0 | 89.54 | .00 | 0 |
| 7120 | MAINTAIN LANDFILL | Person Days | 2 | 0 | 0 | 14 | 0 | 0 |
| | PER HRS | Accomplishment | 21.0 | .0 | 0 | 144.0 | .0 | 0 |
| | | Avg Daily Prod | 10.0 | .0 | 0 | 10.0 | .0 | 0 |
| | | Total Cost | 1001 | 0 | 0 | 6866 | 0 | 0 |
| | | Unit Cost ($) | 47.67 | .00 | 0 | 47.68 | .00 | 0 |
| 9100 | SUPERVISION | Person Days | 13 | 16 | 123 | 88 | 59 | 67 |
| | PER HR | Accomplishment | 126.0 | 160.0 | 127 | 880.0 | 590.0 | 67 |
| | | Avg Daily Prod | 10.0 | 10.0 | 100 | 10.0 | 10.0 | 100 |
| | | Total Cost | 2082 | 2643 | 127 | 14538 | 9747 | 67 |
| | | Unit Cost ($) | 16.52 | 16.52 | 100 | 16.52 | 16.52 | 100 |

| ACTIVITY CODE | ACTIVITY NAME | PERFORMANCE INDICATOR | CURRENT MONTH PERFORMANCE PLAN | ACTUAL | PCT | YEAR TO DATE PERFORMANCE PLAN | ACTUAL | PCT |
|---|---|---|---|---|---|---|---|---|
| 9200 | ADMIN/LV/TRNG PER HR | Person Days | 34 | 0 | 0 | 236 | 0 | 0 |
| | | Accomplishment | 336.0 | .0 | 0 | 2364.0 | .0 | 0 |
| | | Avg Daily Prod | 120.0 | .0 | 0 | 120.0 | .0 | 0 |
| | | Total Cost | 3832 | 0 | 0 | 26959 | 0 | 0 |
| | | Unit Cost ($) | 11.40 | .00 | 0 | 11.40 | .00 | 0 |
| MANAGEMENT UNIT TOTALS: | | Person Days | 195 | 62 | 32 | 1106 | 223 | 20 |
| | | Total Cost | 32417 | 13103 | 40 | 190631 | 43344 | 23 |

| LOCATION/TYPE/ACTIVITY CODE | NAMES | MONTH ACCOMPLISHMENT QTY | UNIT | COST | YEAR TO DATE ACCOMPLISHMENT QTY | UNIT | COST | COST FROM DATE OF FIRST ENTRY |
|---|---|---|---|---|---|---|---|---|
| A001P | A STREET PARKING | | | | | | | |
| P | | | | | | | | |
| 1195 | GEN BIT PVMNT MAINT | 120 | PER HR | 2223 | 240 | PER HR | 4446 | 4446 |
| | | | TOTALS: | 2223 | | | 4446 | 4446 |
| A0051 | CALIFORNIA AVE. | | | | | | | |
| I | | | | | | | | |
| 1730 | BLADE UNPVD SHLDRS | 70 | SHLDR MI | 1076 | 225 | SHLDR MI | 3767 | 3767 |
| 2110 | ROADWAY SWEEPING | 0 | ROAD MI | 0 | 60 | ROAD MI | 1078 | 1078 |
| | | | TOTALS: | 1076 | | | 4845 | 4845 |
| A018P | HEADQUARTERS PARKING | | | | | | | |
| P | | | | | | | | |
| 1195 | GEN BIT PVMNT MAINT | 0 | PER HR | 0 | 40 | PER HR | 888 | 888 |
| | | | TOTALS: | 0 | | | 888 | 888 |
| A046 | BLDG P-130 APRON | | | | | | | |
| A | | | | | | | | |
| 1395 | GEN CONC PVT RPR | 160 | PER HRS | 4672 | 160 | PER HRS | 4672 | 4672 |
| | | | TOTALS: | 4672 | | | 4672 | 4672 |
| A096 | EQUESTRIAN STABLE ROAD | | | | | | | |
| I | | | | | | | | |
| 1510 | BLADE UNPVD SURFCS | 35 | ROAD MI | 1481 | 70 | ROAD MI | 2962 | 2963 |
| 2140 | MACHINE MOWING | 130 | ACRES | 1008 | 260 | ACRES | 2016 | 2016 |
| | | | TOTALS: | 2489 | | | 4978 | 4979 |
| A104 | RESERVOIR ACCESS ROAD | | | | | | | |
| I | | | | | | | | |
| 1510 | BLADE UNPVD SURFCS | 0 | ROAD MI | 0 | 75 | ROAD MI | 2480 | 2480 |
| | | | TOTALS: | 0 | | | 2480 | 2480 |
| DEPOT | ANY OTHER UNASSIGNED LOC | | | | | | | |
| Z | | | | | | | | |
| 6290 | GEN SNOW/ICE CONTROL | 0 | PER HRS | 0 | 590 | PER HRS | 11286 | 11286 |
| 9100 | SUPERVISION | 160 | PER HR | 2643 | 590 | PER HR | 9746 | 9747 |
| | | | TOTALS: | 2643 | | | 21032 | 21033 |

DeLEUW, CATHER & Co. LOCATION PERFORMANCE REPORT ¶Page: 1
Work Management System Period from 10/01/87 TO 04/30/88 Date: 09/19/88
SIERRA ARMY DEPOT PAVEMENT MAINTENANCE Activity: ALL

| LOCATION/TYPE/ACTIVITY CODE | NAMES | | | MONTH ACCOMPLISHMENT QTY | UNIT | COST | YEAR TO DATE ACCOMPLISHMENT QTY | UNIT | COST | COST FROM DATE OF FIRST ENTRY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1195 | GEN BIT PVMNT MAINT | | | | | | | | | |
| A001P | A STREET PARKING | P | | 120 | PER HR | 2223 | 240 | PER HR | 4446 | 4446 |
| A018P | HEADQUARTERS PARKING | P | | 0 | PER HR | 0 | 40 | PER HR | 888 | 888 |
| | | | TOTALS: | 120 | | 2223 | 280 | | 5334 | 5334 |
| 1395 | GEN CONC PVT RPR | | | | | | | | | |
| A046 | BLDG P-130 APRON | A | | 160 | PER HRS | 4672 | 160 | PER HRS | 4672 | 4672 |
| | | | TOTALS: | 160 | | 4672 | 160 | | 4672 | 4672 |
| 1510 | BLADE UNPVD SURFCS | | | | | | | | | |
| A096 | EQUESTRIAN STABLE ROAD | I | | 35 | ROAD MI | 1481 | 70 | ROAD MI | 2962 | 2963 |
| A104 | RESERVOIR ACCESS ROAD | I | | 0 | ROAD MI | 0 | 75 | ROAD MI | 2480 | 2480 |
| | | | TOTALS: | 35 | | 1481 | 145 | | 5442 | 5443 |
| 1730 | BLADE UNPVD SHLDRS | | | | | | | | | |
| A005I | CALIFORNIA AVE. | I | | 70 | SHLDR MI | 1076 | 225 | SHLDR MI | 3767 | 3767 |
| | | | TOTALS: | 70 | | 1076 | 225 | | 3767 | 3767 |
| 2110 | ROADWAY SWEEPING | | | | | | | | | |
| A005I | CALIFORNIA AVE. | I | | 0 | ROAD MI | 0 | 60 | ROAD MI | 1078 | 1078 |
| | | | TOTALS: | 0 | | 0 | 60 | | 1078 | 1078 |
| 2140 | MACHINE MOWING | | | | | | | | | |
| A096 | EQUESTRIAN STABLE ROAD | I | | 130 | ACRES | 1008 | 260 | ACRES | 2016 | 2016 |
| | | | TOTALS: | 130 | | 1008 | 260 | | 2016 | 2016 |
| 6290 | GEN SNOW/ICE CONTROL | | | | | | | | | |
| DEPOT | ANY OTHER UNASSIGNED LOC | Z | | 0 | PER HRS | 0 | 590 | PER HRS | 11286 | 11286 |
| | | | TOTALS: | 0 | | 0 | 590 | | 11286 | 11286 |
| 9100 | SUPERVISION | | | | | | | | | |
| DEPOT | ANY OTHER UNASSIGNED LOC | Z | | 160 | PER HR | 2643 | 590 | PER HR | 9746 | 9747 |
| | | | TOTALS: | 160 | | 2643 | 590 | | 9746 | 9747 |

| LOCATION/TYPE/ACTIVITY CODE | NAMES | MONTH ACCOMPLISHMENT QTY | UNIT | COST | YEAR TO DATE ACCOMPLISHMENT QTY | UNIT | COST | COST FROM DATE OF FIRST ENTRY |
|---|---|---|---|---|---|---|---|---|
| A | | | | | | | | |
| A046 | BLDG P-130 APRON | | | | | | | |
| 1395 | GEN CONC PVT RPR | 160 | PER HRS | 4672 | 160 | PER HRS | 4672 | 4672 |
| | | | TOTALS: | 4672 | | | 4672 | 4672 |
| I | | | | | | | | |
| A005I | CALIFORNIA AVE. | | | | | | | |
| 1730 | BLADE UNPVD SHLDRS | 70 | SHLDR MI | 1076 | 225 | SHLDR MI | 3767 | 3767 |
| 2110 | ROADWAY SWEEPING | 0 | ROAD MI | 0 | 60 | ROAD MI | 1078 | 1078 |
| A096 | EQUESTRIAN STABLE ROAD | | | | | | | |
| 1510 | BLADE UNPVD SURFCS | 35 | ROAD MI | 1481 | 70 | ROAD MI | 2962 | 2963 |
| 2140 | MACHINE MOWING | 130 | ACRES | 1008 | 260 | ACRES | 2016 | 2016 |
| A104 | RESERVOIR ACCESS ROAD | | | | | | | |
| 1510 | BLADE UNPVD SURFCS | 0 | ROAD MI | 0 | 75 | ROAD MI | 2480 | 2480 |
| | | | TOTALS: | 3565 | | | 12303 | 12304 |
| P | | | | | | | | |
| A001P | A STREET PARKING | | | | | | | |
| 1195 | GEN BIT PVMNT MAINT | 120 | PER HR | 2223 | 240 | PER HR | 4446 | 4446 |
| A018P | HEADQUARTERS PARKING | | | | | | | |
| 1195 | GEN BIT PVMNT MAINT | 0 | PER HR | 0 | 40 | PER HR | 888 | 888 |
| | | | TOTALS: | 2223 | | | 5334 | 5334 |
| Z | | | | | | | | |
| DEPOT | ANY OTHER UNASSIGNED LOC | | | | | | | |
| 6290 | GEN SNOW/ICE CONTROL | 0 | PER HRS | 0 | 590 | PER HRS | 11286 | 11286 |
| 9100 | SUPERVISION | 160 | PER HR | 2643 | 590 | PER HR | 9746 | 9747 |
| | | | TOTALS: | 2643 | | | 21032 | 21033 |

Activity: 1195 GEN BIT PVMNT MAINT
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 260.00 MILES | | | | |
| Daily Prod: | 30.00 PER HR | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 5.00 | 1.92 |
| Cost/Crew Day: | $ 556 | Annual Work Quantity: | | 1,300.00 | 499.20 |
| Cost/Unit of Work: | $ 18 | Total Cost: | $ | 24,066 | $ 9,226 |
| Standard Crew Size: | 3.0 | Labor: | $ | 14,778 | $ 5,666 |
| Deviation Level: | 20 % | Equipment: | $ | 2,793 | $ 1,071 |
| | | Material: | $ | 6,495 | $ 2,490 |
| | | Total Crew Days: | | 43.3 | 16.6 |
| | | Total Person Days: | | 129.9 | 49.8 |
| | | Cost/Unit of Inv: | $ | 93 | $ 35 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.3 | 1.4 | 1.3 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 16.6 |

'P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 34/HR) | | EQUIPMENT ( 6/HR) | | MATERIAL ( 150/DAY) | |
|---|---|---|---|---|---|
| 1120 ENG EQUIP OP | 1.0 | 3010 PICKUP-2WD | 1.0 | 5600 MISC ROAD MTL | 150.0 |
| 1130 MOT VEH OP | 1.0 | 3040 DUMP TRUCKS-5YD | 1.0 | | |
| 1160 LABORER | 1.0 | 4250 VIBRATORY TAMP | 1.0 | | |

S.L. Expn:Y **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 1110 | BITUMINOUS ROAD MILES | | | | |
| | INVY | 260.00 | | | |
| | SL | 5.00 | | | |

TOTAL INVENTORY= 260.00 DES. EQUIV. SL.= 5.00 AWQD= 1,300.00
PLN. EQUIV. SL.= 1.92 AWQP= 499.20

Activity: 1395 GEN CONC PVT RPR
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

| | | | Desired | Planned |
|---|---|---|---|---|
| Feature Inv: | 200.00 K SQ YDS | | | |
| Daily Prod: | 20.00 PER HRS | | | |
| Hours/Act Day: | 10.0 | Service Level: | 1.50 | 1.24 |
| Cost/Crew Day: | $ 833 | Annual Work Quantity: | 300.00 | 248.00 |
| Cost/Unit of Work: | $ 42 | Total Cost: | $ 12,491 | $ 10,325 |
| Standard Crew Size: | 2.0 | Labor: | $ 2,891 | $ 2,389 |
| Deviation Level: | 20 % | Equipment: | $ 225 | $ 186 |
| | | Material: | $ 9,375 | $ 7,750 |
| | | Total Crew Days: | 15.0 | 12.4 |
| | | Total Person Days: | 30.0 | 24.8 |
| | | Cost/Unit of Inv: | $ 62 | $ 52 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.0 | .9 | .9 | .9 | .9 | .9 | .9 | 12.4 |

P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 19/HR) | | EQUIPMENT ( 2/HR) | | MATERIAL ( 625/DAY) | |
|---|---|---|---|---|---|
| 1130 MOT VEH OP | 1.0 | 3010 PICKUP-2WD | 1.0 | 5140 CONCRETE-REDIMX | 6.0 |
| 1160 LABORER | 1.0 | | | 5180 EPOXY MIX | 4.0 |
| | | | | 5600 MISC ROAD MTL | 25.0 |

S.L. Expn:Y **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 1300 | CONCRETE PAVEME | K SQ YDS | | | |
| | INVY | 200.00 | | | |
| | SL | 1.50 | | | |

TOTAL INVENTORY= 200.00 DES. EQUIV. SL.= 1.50 AWQD= 300.00
PLN. EQUIV. SL.= 1.24 AWQP= 248.00

Activity: 1510 BLADE UNPVD SURFCS
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

| | | | Desired | Planned |
|---|---|---|---|---|
| Feature Inv: | 300.00 MILES | | | |
| Daily Prod: | 9.00 ROAD MI | | | |
| Hours/Act Day: | 10.0 | Service Level: | 2.50 | 2.50 |
| Cost/Crew Day: | $ 357 | Annual Work Quantity: | 750.00 | 750.00 |
| Cost/Unit of Work: | $ 40 | Total Cost: | $ 29,721 | $ 29,721 |
| Standard Crew Size: | 1.5 | Labor: | $ 16,793 | $ 16,793 |
| Deviation Level: | 20 % | Equipment: | $ 12,928 | $ 12,928 |
| | | Material: | $ 0 | $ 0 |
| | | Total Crew Days: | 83.3 | 83.3 |
| | | Total Person Days: | 125.0 | 125.0 |
| | | Cost/Unit of Inv: | $ 99 | $ 99 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.0 | 7.0 | 6.0 | 6.0 | 6.3 | 6.0 | 8.0 | 8.0 | 8.0 | 7.0 | 7.0 | 7.0 | 83.3 |

P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 20/HR) | | EQUIPMENT ( 16/HR) | | MATERIAL ( 0/DAY) |
|---|---|---|---|---|
| 1120 ENG EQUIP OP | 1.0 | 3220 ROAD GRADER | 1.0 | |
| 1130 MOT VEH OP | .5 | 3010 PICKUP-2WD | .1 | |
| | | 3090 WATER DISTRIBUT | .5 | |

S.L. Expn:Y **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 1500 | UNPAVED ROAD | MILES | | | |
| INVY | | 300.00 | | | |
| SL | | 2.50 | | | |

| | | | | | |
|---|---|---|---|---|---|
| TOTAL INVENTORY= | 300.00 | DES. EQUIV. SL.= | 2.50 | AWQD= | 750.00 |
| | | PLN. EQUIV. SL.= | 2.50 | AWQP= | 750.00 |

Activity: 1520 STAB UNPVD SRFC
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 300.00 MILES | | | | |
| Daily Prod: | 4.00 ROAD MI | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | .25 | .15 |
| Cost/Crew Day: | $ 1152 | Annual Work Quantity: | | 75.00 | 45.00 |
| Cost/Unit of Work: | $ 289 | Total Cost: | $ | 21,661 | $ 13,020 |
| Standard Crew Size: | 4.0 | Labor: | $ | 9,573 | $ 5,754 |
| Deviation Level: | 20 % | Equipment: | $ | 6,448 | $ 3,876 |
| | | Material: | $ | 5,640 | $ 3,390 |
| | | Total Crew Days: | | 18.8 | 11.3 |
| | | Total Person Days: | | 75.2 | 45.2 |
| | | Cost/Unit of Inv: | $ | 72 | $ 43 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.1 | 1.1 | 1.1 | 1.1 | 1.0 | .9 | .9 | .9 | .9 | .9 | .7 | .7 | 11.3 |

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

| LABOR ( 51/HR) | | EQUIPMENT ( 34/HR) | | MATERIAL ( 300/DAY) | |
|---|---|---|---|---|---|
| 1120 ENG EQUIP OP | 2.0 | 3220 ROAD GRADER | 1.0 | 5080 BASE MATERIAL | 20.0 |
| 1130 MOT VEH OP | 2.0 | 3270 ROLLER | 1.0 | | |
| | | 3090 WATER DISTRIBUT | 1.0 | | |
| | | 3040 DUMP TRUCKS-5YD | 1.0 | | |

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

| CODE | NAME | TOTAL | 1 | 2 | 3 |
|---|---|---|---|---|---|
| 1500 | UNPAVED ROAD | MILES | | | |
| INVY | | 300.00 | | | |
| SL | | .25 | | | |

TOTAL INVENTORY= 300.00 DES. EQUIV. SL.= .25 AWQD= 75.00
PLN. EQUIV. SL.= .15 AWQP= 45.00

Activity: 1540 DUST CONTROL
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

| | | | Desired | Planned |
|---|---|---|---|---|
| Feature Inv: | 300.00 MILES | | | |
| Daily Prod: | 6.00 ROAD MI | | | |
| Hours/Act Day: | 10.0 | Service Level: | .50 | .30 |
| Cost/Crew Day: | $ 298 | Annual Work Quantity: | 150.00 | 90.00 |
| Cost/Unit of Work: | $ 50 | Total Cost: | $ 7,438 | $ 4,463 |
| Standard Crew Size: | 1.0 | Labor: | $ 2,650 | $ 1,590 |
| Deviation Level: | 20 % | Equipment: | $ 1,663 | $ 998 |
| | | Material: | $ 3,125 | $ 1,875 |
| | | Total Crew Days: | 25.0 | 15.0 |
| | | Total Person Days: | 25.0 | 15.0 |
| | | Cost/Unit of Inv: | $ 25 | $ 15 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.4 | 1.4 | 1.2 | 1.4 | 1.4 | 1.4 | 1.3 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 15.0 |

P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 11/HR) | | EQUIPMENT ( 7/HR) | | MATERIAL ( 125/DAY) | |
|---|---|---|---|---|---|
| 1130 MOT VEH OP | 1.0 | 3090 WATER DISTRIBUT | 1.0 | 5170 DUST PALLIATVS | 25.0 |

S.L. Expn:N **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 1500 | UNPAVED ROAD | MILES | | | |
| | INVY | 300.00 | | | |
| | SL | .50 | | | |

| | | | | | |
|---|---|---|---|---|---|
| TOTAL INVENTORY= | 300.00 | DES. EQUIV. SL.= | .50 | AWQD= | 150.00 |
| | | PLN. EQUIV. SL.= | .30 | AWQP= | 90.00 |

Activity: 1730 BLADE UNPVD SHLDRS
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N **A C T I V I T Y S U M M A R Y**

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 1000.00 MILES | | | | |
| Daily Prod: | 20.00 SHLDR MI | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 3.00 | 2.00 |
| Cost/Crew Day: | $ 269 | Annual Work Quantity: | | 3,000.00 | 2,000.00 |
| Cost/Unit of Work: | $ 13 | Total Cost: | $ | 40,365 | $ 26,910 |
| Standard Crew Size: | 1.0 | Labor: | $ | 22,290 | $ 14,860 |
| Deviation Level: | 20 % | Equipment: | $ | 18,075 | $ 12,050 |
| | | Material: | $ | 0 | $ 0 |
| | | Total Crew Days: | | 150.0 | 100.0 |
| | | Total Person Days: | | 150.0 | 100.0 |
| | | Cost/Unit of Inv: | $ | 40 | $ 27 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8.3 | 8.3 | 8.3 | 8.6 | 8.6 | 8.6 | 8.3 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 100.0 |

P.G. Expn:N **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 15/HR) | | EQUIPMENT ( 12/HR) | | MATERIAL ( 0/DAY) |
|---|---|---|---|---|
| 1120 ENG EQUIP OP | 1.0 | 3220 ROAD GRADER | 1.0 | |

S.L. Expn:Y **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | 1 | 2 | 3 |
|---|---|---|---|---|---|
| 1700 | UNPAVED SHLDRS | MILES | | | |
| | INVf | 1000.00 | | | |
| | SL | 3.00 | | | |

TOTAL INVENTORY= 1,000.00 DES. EQUIV. SL.= 3.00 AWQD= 3,000.00
PLN. EQUIV. SL.= 2.00 AWQP= 2,000.00

Activity: 1820 MAINT RR SWITCH
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 10.00 EA | | | | |
| Daily Prod: | 3.00 SWITCH | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 12.00 | 10.00 |
| Cost/Crew Day: | $ 239 | Annual Work Quantity: | | 120.00 | 100.00 |
| Cost/Unit of Work: | $ 80 | Total Cost: | $ | 9,576 | $ 7,972 |
| Standard Crew Size: | 2.0 | Labor: | $ | 7,776 | $ 6,474 |
| Deviation Level: | 20 % | Equipment: | $ | 600 | $ 500 |
| | | Material: | $ | 1,200 | $ 999 |
| | | Total Crew Days: | | 40.0 | 33.3 |
| | | Total Person Days: | | 80.0 | 66.6 |
| | | Cost/Unit of Inv: | $ | 958 | $ 797 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.0 | 3.0 | 3.0 | 3.0 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.6 | 2.6 | 2.6 | 33.3 |

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

| LABOR ( 19/HR) | | EQUIPMENT ( 2/HR) | | MATERIAL ( 30/DAY) | |
|---|---|---|---|---|---|
| 1170 RR MNT OP | 2.0 | 3010 PICKUP-2WD | 1.0 | 5630 MISC RR MTL | 30.0 |

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 1820 | RR SWITCH | EA | | | |
| | INVY | 10.00 | | | |
| | SL | 12.00 | | | |

TOTAL INVENTORY= 10.00 DES. EQUIV. SL.= 12.00 AWQD= 120.00
PLN. EQUIV. SL.= 10.00 AWQP= 100.00

Activity: 1830 REPAIR RR TRACK
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

| | | | Desired | Planned |
|---|---|---|---|---|
| Feature Inv: | 35.00 MILES | | | |
| Daily Prod: | .50 MILE | | | |
| Hours/Act Day: | 10.0 | Service Level: | 1.00 | .71 |
| Cost/Crew Day: | $ 229 | Annual Work Quantity: | 35.00 | 24.85 |
| Cost/Unit of Work: | $ 459 | Total Cost: | $ 16,058 | $ 11,401 |
| Standard Crew Size: | 2.0 | Labor: | $ 13,608 | $ 9,662 |
| Deviation Level: | 20 % | Equipment: | $ 1,050 | $ 746 |
| | | Material: | $ 1,400 | $ 994 |
| | | Total Crew Days: | 70.0 | 49.7 |
| | | Total Person Days: | 140.0 | 99.4 |
| | | Cost/Unit of Inv: | $ 459 | $ 326 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.2 | 4.2 | 4.0 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.0 | 3.9 | 49.7 |

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

| LABOR ( 19/HR) | | EQUIPMENT ( 2/HR) | | MATERIAL ( 20/DAY) | |
|---|---|---|---|---|---|
| 1170 RR MNT OP | 2.0 | 3010 PICKUP-2WD | 1.0 | 5630 MISC RR MTL | 20.0 |

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

| CODE | NAME | TOTAL | 1 | 2 | 3 |
|---|---|---|---|---|---|
| 1830 | RR TRACK | MILES | | | |
| | INVY | 35.00 | | | |
| | SL | 1.00 | | | |

TOTAL INVENTORY= 35.00 DES. EQUIV. SL.= 1.00 AWQD= 35.00
PLN. EQUIV. SL.= .71 AWQP= 24.85

Activity: 2110 ROADWAY SWEEPING
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 260.00 MILES | | | | |
| Daily Prod: | 12.00 ROAD MI | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 4.00 | 2.00 |
| Cost/Crew Day: | $ 286 | Annual Work Quantity: | | 1,040.00 | 520.00 |
| Cost/Unit of Work: | $ 24 | Total Cost: | $ | 24,770 | $ 12,371 |
| Standard Crew Size: | 1.5 | Labor: | $ | 17,479 | $ 8,729 |
| Deviation Level: | 20 % | Equipment: | $ | 7,291 | $ 3,642 |
| | | Material: | $ | 0 | $ 0 |
| | | Total Crew Days: | | 86.7 | 43.3 |
| | | Total Person Days: | | 130.1 | 65.0 |
| | | Cost/Unit of Inv: | $ | 95 | $ 48 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CO Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.7 | 3.7 | 3.7 | 3.8 | 3.8 | 3.8 | 3.8 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 43.3 |

P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 20/HR) | | EQUIPMENT ( 8/HR) | | MATERIAL ( 0/DAY) |
|---|---|---|---|---|
| 1130 MOT VEH OP | .5 | 3280 STREET SWEEPER | .5 | |
| 1120 ENG EQUIP OP | 1.0 | 3283 SWEEPER W/MAGNT | .5 | |
| | | 3090 WATER DISTRIBUT | .5 | |

S.L. Expn:N **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 1110 | BITUMINOUS ROAD MILES | | | | |
| | INVY | 260.00 | | | |
| | SL | 4.00 | | | |

TOTAL INVENTORY= 260.00 DES. EQUIV. SL.= 4.00 AWQD= 1,040.00
PLN. EQUIV. SL.= 2.00 AWQP= 520.00

Activity: 2120 RUNWAY SWEEPING
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 150.00 K SQ YDS | | | | |
| Daily Prod: | 150.00 K SQ YD | | | | |
| Hours/Act Day: | 10.0 | | Service Level: | 20.00 | 15.00 |
| Cost/Crew Day: | $ 167 | | Annual Work Quantity: | 3,000.00 | 2,250.00 |
| Cost/Unit of Work: | $ 1 | | Total Cost: | $ 3,330 | $ 2,498 |
| Standard Crew Size: | 1.0 | | Labor: | $ 2,120 | $ 1,590 |
| Deviation Level: | 20 % | | Equipment: | $ 1,210 | $ 908 |
| | | | Material: | $ 0 | $ 0 |
| | | | Total Crew Days: | 20.0 | 15.0 |
| | | | Total Person Days: | 20.0 | 15.0 |
| | | | Cost/Unit of Inv: | $ 22 | $ 17 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 15.0 |

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

| LABOR ( 11/HR) | | EQUIPMENT ( 6/HR) | | MATERIAL ( 0/DAY) |
|---|---|---|---|---|
| 1130 MOT VEH OP | 1.0 | 3282 RUNWAY SWEEPER | 1.0 | |

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

| CODE | NAME | TOTAL | --1-- | ----2---- | ---3--- |
|---|---|---|---|---|---|
| 1310 | RUNWAY/TAXIWAY | K SQ YDS | | | |
| | INVY | 150.00 | | | |
| | SL | 20.00 | | | |

TOTAL INVENTORY= 150.00 DES. EQUIV. SL.= 20.00 AWQD= 3,000.00
PLN. EQUIV. SL.= 15.00 AWQP= 2,250.00

Activity: 2140 MACHINE MOWING
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N **A C T I V I T Y S U M M A R Y**

| | | | Desired | Planned |
|---|---|---|---|---|
| Feature Inv: | 400.00 ACRES | | | |
| Daily Prod: | 15.00 ACRES | | | |
| Hours/Act Day: | 10.0 | Service Level: | 5.00 | 4.00 |
| Cost/Crew Day: | $ 126 | Annual Work Quantity: | 2,000.00 | 1,600.00 |
| Cost/Unit of Work: | $ 8 | Total Cost: | $ 16,796 | $ 13,444 |
| Standard Crew Size: | 1.0 | Labor: | $ 14,130 | $ 11,310 |
| Deviation Level: | 20 % | Equipment: | $ 2,666 | $ 2,134 |
| | | Material: | $ 0 | $ 0 |
| | | Total Crew Days: | 133.3 | 106.7 |
| | | Total Person Days: | 133.3 | 106.7 |
| | | Cost/Unit of Inv: | $ 42 | $ 34 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9.0 | .0 | .0 | .0 | .0 | 10.7 | 12.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 106.7 |

P.G. Expn:N **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 11/HR) | | EQUIPMENT ( 2/HR) | | MATERIAL ( 0/DAY) |
|---|---|---|---|---|
| 1130 MOT VEH OP | 1.0 | 3260 TRACTOR MOWER | 1.0 | |

S.L. Expn:Y **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 2100 | MOWABLE ROADSID | ACRES | | | |
| | INVY | 400.00 | | | |
| | SL | 5.00 | | | |

TOTAL INVENTORY= 400.00 DES. EQUIV. SL.= 5.00 AWQD= 2,000.00
PLN. EQUIV. SL.= 4.00 AWQP= 1,600.00

Activity: 2150 HAND MOWING TRIMMING
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

| | | | Desired | Planned |
|---|---|---|---|---|
| Feature Inv: | 400.00 ACRES | | | |
| Daily Prod: | 20.00 PER HRS | | | |
| Hours/Act Day: | 10.0 | Service Level: | 2.00 | 1.25 |
| Cost/Crew Day: | $ 256 | Annual Work Quantity: | 800.00 | 500.00 |
| Cost/Unit of Work: | $ 13 | Total Cost: | $ 10,256 | $ 6,410 |
| Standard Crew Size: | 2.0 | Labor: | $ 6,936 | $ 4,335 |
| Deviation Level: | 20 % | Equipment: | $ 3,320 | $ 2,075 |
| | | Material: | $ 0 | $ 0 |
| | | Total Crew Days: | 40.0 | 25.0 |
| | | Total Person Days: | 80.0 | 50.0 |
| | | Cost/Unit of Inv: | $ 26 | $ 16 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.0 | 2.0 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 25.0 |

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

| LABOR ( 17/HR) | | EQUIPMENT ( 8/HR) | | MATERIAL ( 0/DAY) | |
|---|---|---|---|---|---|
| 1160 LABORER | 2.0 | 4180 RIDING MOWERS | 2.0 | | |

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

| CODE | NAME | TOTAL | ----1---- | ----2---- | ----3---- |
|---|---|---|---|---|---|
| 2100 | MOWABLE ROADSID | ACRES | | | |
| | INVY | 400.00 | | | |
| | SL | 2.00 | | | |

| | | | | | |
|---|---|---|---|---|---|
| TOTAL INVENTORY= | 400.00 | DES. EQUIV. SL.= | 2.00 | AWQD= | 800.00 |
| | | PLN. EQUIV. SL.= | 1.25 | AWQP= | 500.00 |

Activity: 2151 LAWN MOWING
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N **A C T I V I T Y S U M M A R Y**

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 150.00 ACRE | | | | |
| Daily Prod: | 10.00 ACRES | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 12.00 | 9.60 |
| Cost/Crew Day: | $ 256 | Annual Work Quantity: | | 1,800.00 | 1,440.00 |
| Cost/Unit of Work: | $ 26 | Total Cost: | $ | 46,152 | $ 36,922 |
| Standard Crew Size: | 2.0 | Labor: | $ | 31,212 | $ 24,970 |
| Deviation Level: | 20 % | Equipment: | $ | 14,940 | $ 11,952 |
| | | Material: | $ | 0 | $ 0 |
| | | Total Crew Days: | | 180.0 | 144.0 |
| | | Total Person Days: | | 360.0 | 288.0 |
| | | Cost/Unit of Inv: | $ | 308 | $ 246 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16.0 | .0 | .0 | .0 | .0 | 16.0 | 20.0 | 20.0 | 18.0 | 18.0 | 18.0 | 18.0 | 144.0 |

P.G. Expn:N **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 17/HR) | | EQUIPMENT ( 8/HR) | | MATERIAL ( 0/DAY) |
|---|---|---|---|---|
| 1160 LABORER | 2.0 | 4180 RIDING MOWERS | 2.0 | |

S.L. Expn:N **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 2140 | MOWABLE LAWN | ACRE | | | |
| | INVY | 150.00 | | | |
| | SL | 12.00 | | | |

| | | | | | |
|---|---|---|---|---|---|
| TOTAL INVENTORY= | 150.00 | DES. EQUIV. SL.= | 12.00 | AWQD= | 1,800.00 |
| | | PLN. EQUIV. SL.= | 9.60 | AWQP= | 1,440.00 |

Activity: 2160 SPRAYING/WEED CONTRL
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 400.00 ACRES | | | | |
| Daily Prod: | 10.00 PER HRS | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 1.00 | .75 |
| Cost/Crew Day: | $ 266 | Annual Work Quantity: | | 400.00 | 300.00 |
| Cost/Unit of Work: | $ 27 | Total Cost: | $ | 10,640 | $ 7,980 |
| Standard Crew Size: | 1.0 | Labor: | $ | 4,240 | $ 3,180 |
| Deviation Level: | 20 % | Equipment: | $ | 800 | $ 600 |
| | | Material: | $ | 5,600 | $ 4,200 |
| | | Total Crew Days: | | 40.0 | 30.0 |
| | | Total Person Days: | | 40.0 | 30.0 |
| | | Cost/Unit of Inv: | $ | 27 | $ 20 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.0 | .0 | .0 | .0 | .0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 30.0 |

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

| LABOR ( 11/HR) | | EQUIPMENT ( 2/HR) | | MATERIAL ( 140/DAY) | |
|---|---|---|---|---|---|
| 1130 MOT VEH OP | 1.0 | 3260 TRACTOR MOWER | 1.0 | 5110 CHEMICAL-WEED | 20.0 |

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

| CODE | NAME | TOTAL | ---1--- | ---2--- | ---3--- |
|---|---|---|---|---|---|
| 2000 | MNTND GROUNDS | ACRES | | | |
| | INVY | 400.00 | | | |
| | SL | 1.00 | | | |

| | | | | | |
|---|---|---|---|---|---|
| TOTAL INVENTORY= | 400.00 | DES. EQUIV. SL.= | 1.00 | AWQD= | 400.00 |
| | | PLN. EQUIV. SL.= | .75 | AWQP= | 300.00 |

Activity: 2210 REPAIR FENCES
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N ACTIVITY SUMMARY

| | | | Desired | Planned |
|---|---|---|---|---|
| Feature Inv: | 10000.00 LIN FT | | | |
| Daily Prod: | 300.00 LIN FT | | | |
| Hours/Act Day: | 10.0 | Service Level: | .40 | .30 |
| Cost/Crew Day: | $ 540 | Annual Work Quantity: | 4,000.00 | 3,000.00 |
| Cost/Unit of Work: | $ 2 | Total Cost: | $ 7,181 | $ 5,399 |
| Standard Crew Size: | 3.0 | Labor: | $ 3,716 | $ 2,794 |
| Deviation Level: | 20 % | Equipment: | $ 472 | $ 355 |
| | | Material: | $ 2,993 | $ 2,250 |
| | | Total Crew Days: | 13.3 | 10.0 |
| | | Total Person Days: | 39.9 | 30.0 |
| | | Cost/Unit of Inv: | $ 1 | $ 1 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.3 | 1.3 | 1.0 | .9 | .9 | .8 | .8 | .6 | .6 | .6 | .6 | .6 | 10.0 |

P.G. Expn:N LABOR, EQUIPMENT & MATERIAL

| LABOR ( 28/HR) | | EQUIPMENT ( 4/HR) | | MATERIAL ( 225/DAY) | |
|---|---|---|---|---|---|
| 1130 MOT VEH OP | 1.0 | 3040 DUMP TRUCKS-5YD | 1.0 | 5190 FENCE HARDWARE | 100.0 |
| 1160 LABORER | 2.0 | | | 5220 FENCING | 100.0 |

S.L. Expn:Y FEATURE INVENTORY DETAIL

| CODE | NAME | TOTAL | 1 | 2 | 3 |
|---|---|---|---|---|---|
| 2220 | FENCE | LIN FT | | | |
| | INVY 10000.00 | | | | |
| | SL .40 | | | | |

TOTAL INVENTORY= 10,000.00 DES. EQUIV. SL.= .40 AWQD= 4,000.00
PLN. EQUIV. SL.= .30 AWQP= 3,000.00

Activity: 2230 REMOVE RDWY DEBRIS
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N **A C T I V I T Y S U M M A R Y**

| | | | Desired | Planned |
|---|---|---|---|---|
| Feature Inv: | 760.00 MILE | | | |
| *Daily Prod:* | 30.00 PER HRS | | | |
| Hours/Act Day: | 10.0 | Service Level: | 2.00 | 1.92 |
| Cost/Crew Day: | $ 466 | Annual Work Quantity: | 1,520.00 | 1,459.20 |
| Cost/Unit of Work: | $ 16 | Total Cost: | $ 23,606 | $ 22,628 |
| Standard Crew Size: | 3.0 | Labor: | $ 17,304 | $ 16,587 |
| Deviation Level: | 20 % | Equipment: | $ 6,302 | $ 6,041 |
| | | Material: | $ 0 | $ 0 |
| | | Total Crew Days: | 50.7 | 48.6 |
| | | Total Person Days: | 152.1 | 145.8 |
| | | Cost/Unit of Inv: | $ 31 | $ 30 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.2 | 4.2 | 4.2 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.6 |

*P.G. Expn:N* *L A B O R, E Q U I P M E N T & M A T E R I A L*

| LABOR ( 34/HR) | | EQUIPMENT ( 12/HR) | | MATERIAL ( 0/DAY) |
|---|---|---|---|---|
| 1130 MOT VEH OP | 1.0 | 3210 FRONT LOADER | 1.0 | |
| 1120 ENG EQUIP OP | 1.0 | 3040 DUMP TRUCKS-5YD | 1.0 | |
| 1160 LABORER | 1.0 | | | |

S.L. Expn:Y **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | 1 | 2 | 3 |
|---|---|---|---|---|---|
| 1600 | TOTAL ROADWAY | MILE | | | |
| | INVY | 760.00 | | | |
| | SL | 2.00 | | | |

| | | | | | |
|---|---|---|---|---|---|
| TOTAL INVENTORY= | 760.00 | DES. EQUIV. SL.= | 2.00 | AWQD= | 1,520.00 |
| | | PLN. EQUIV. SL.= | 1.92 | AWQP= | 1,459.20 |

Activity: 2290 GEN GROUNDS MAINT
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N **A C T I V I T Y S U M M A R Y**

| | | | Desired | Planned |
|---|---|---|---|---|
| Feature Inv: | 400.00 ACRES | | | |
| Daily Prod: | 20.00 PER HRS | | | |
| Hours/Act Day: | 10.0 | Service Level: | 1.00 | .75 |
| Cost/Crew Day: | $ 228 | Annual Work Quantity: | 400.00 | 300.00 |
| Cost/Unit of Work: | $ 11 | Total Cost: | $ 4,554 | $ 3,416 |
| Standard Crew Size: | 2.0 | Labor: | $ 3,854 | $ 2,891 |
| Deviation Level: | 20 % | Equipment: | $ 300 | $ 225 |
| | | Material: | $ 400 | $ 300 |
| | | Total Crew Days: | 20.0 | 15.0 |
| | | Total Person Days: | 40.0 | 30.0 |
| | | Cost/Unit of Inv: | $ 11 | $ 9 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.3 | 1.3 | 1.2 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 15.0 |

P.G. Expn:N **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 19/HR) | | EQUIPMENT ( 2/HR) | | MATERIAL ( 20/DAY) | |
|---|---|---|---|---|---|
| 1130 MOT VEH OP | 1.0 | 3010 PICKUP-2WD | 1.0 | 5610 MISC GRND MTL | 20.0 |
| 1160 LABORER | 1.0 | | | | |

S.L. Expn:N **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 2000 | MNTND GROUNDS | ACRES | | | |
| | INVY | 400.00 | | | |
| | SL | 1.00 | | | |

| | | | | | |
|---|---|---|---|---|---|
| TOTAL INVENTORY= | 400.00 | DES. EQUIV. SL.= | 1.00 | AWQD= | 400.00 |
| | | PLN. EQUIV. SL.= | .75 | AWQP= | 300.00 |

Activity: 3190 GEN DRAINAGE MAINT
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N **A C T I V I T Y S U M M A R Y**

| | | | Desired | Planned |
|---|---|---|---|---|
| Feature Inv: | 1.00 EA | | | |
| Daily Prod: | 20.00 PER HR | | | |
| Hours/Act Day: | 10.0 | Service Level: | 200.00 | 200.00 |
| Cost/Crew Day: | $ 258 | Annual Work Quantity: | 200.00 | 200.00 |
| Cost/Unit of Work: | $ 13 | Total Cost: | $ 2,582 | $ 2,582 |
| Standard Crew Size: | 2.0 | Labor: | $ 1,927 | $ 1,927 |
| Deviation Level: | 20 % | Equipment: | $ 355 | $ 355 |
| | | Material: | $ 300 | $ 300 |
| | | Total Crew Days: | 10.0 | 10.0 |
| | | Total Person Days: | 20.0 | 20.0 |
| | | Cost/Unit of Inv: | $ 2582 | $ 2582 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .9 | .9 | .9 | .9 | .8 | .8 | .8 | .8 | .9 | .8 | .8 | .8 | 10.0 |

P.G. Expn:N **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 19/HR) | | EQUIPMENT ( 4/HR) | | MATERIAL ( 30/DAY) | |
|---|---|---|---|---|---|
| 1160 LABORER | 1.0 | 3040 DUMP TRUCKS-5YD | 1.0 | 5600 MISC ROAD MTL | 30.0 |
| 1130 MOT VEH OP | 1.0 | | | | |

S.L. Expn:N **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | 1 | 2 | 3 |
|---|---|---|---|---|---|
| 9100 | YEAR | EA | | | |
| INVY | | 1.00 | | | |
| SL | | 200.00 | | | |

TOTAL INVENTORY= 1.00 DES. EQUIV. SL.= 200.00 AWQD= 200.00
PLN. EQUIV. SL.= 200.00 AWQP= 200.00

Activity: 5120 REPAIR SIGNS
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 300.00 EA | | | | |
| Daily Prod: | 5.00 signs | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | .30 | .25 |
| Cost/Crew Day: | $ 288 | Annual Work Quantity: | | 90.00 | 75.00 |
| Cost/Unit of Work: | $ 58 | Total Cost: | $ | 5,179 | $ 4,316 |
| Standard Crew Size: | 2.0 | Labor: | $ | 3,469 | $ 2,891 |
| Deviation Level: | 20 % | Equipment: | $ | 270 | $ 225 |
| | | Material: | $ | 1,440 | $ 1,200 |
| | | Total Crew Days: | | 18.0 | 15.0 |
| | | Total Person Days: | | 36.0 | 30.0 |
| | | Cost/Unit of Inv: | $ | 17 | $ 14 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 1.0 | 1.0 | 1.0 | 15.0 |

P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 19/HR) | | EQUIPMENT ( 2/HR) | | MATERIAL ( 80/DAY) | |
|---|---|---|---|---|---|
| 1130 MOT VEH OP | 1.0 | 3010 PICKUP-2WD | 1.0 | 5440 SIGNS-TRAFFIC | 2.0 |
| 1160 LABORER | 1.0 | | | | |

S.L. Expn:Y **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|---|
| 5120 | SIGNS | | EA | | | |
| | INVY | 300.00 | | | | |
| | SL | .30 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| TOTAL INVENTORY= | 300.00 | DES. EQUIV. SL.= | .30 | AWOD= | 90.00 |
| | | PLN EQUIV. SL.= | .25 | AWOP= | 75.00 |

Activity: 5190 GEN TRAFFIC SRVC MNT
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N **A C T I V I T Y S U M M A R Y**

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 1.00 EA | | | | |
| Daily Prod: | 20.00 PER HRS | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 150.00 | 125.00 |
| Cost/Crew Day: | $ 258 | Annual Work Quantity: | | 150.00 | 125.00 |
| Cost/Unit of Work: | $ 13 | Total Cost: | $ | 1,933 | $ 1,624 |
| Standard Crew Size: | 2.0 | Labor: | $ | 1,445 | $ 1,214 |
| Deviation Level: | 20 % | Equipment: | $ | 113 | $ 95 |
| | | Material: | $ | 375 | $ 315 |
| | | Total Crew Days: | | 7.5 | 6.3 |
| | | Total Person Days: | | 15.0 | 12.6 |
| | | Cost/Unit of Inv: | $ | 1933 | $ 1624 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .6 | .6 | .6 | .5 | .5 | .5 | .5 | .5 | .5 | .5 | .5 | .5 | 6.3 |

P.G. Expn:N **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 19/HR) | | EQUIPMENT ( 2/HR) | | MATERIAL ( 50/DAY) | |
|---|---|---|---|---|---|
| 1130 MOT VEH OP | 1.0 | 3010 PICKUP-2WD | 1.0 | 5620 MISC TRAFFIC MT | 50.0 |
| 1160 LABORER | 1.0 | | | | |

S.L. Expn:N **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | 1 | 2 | 3 |
|---|---|---|---|---|---|
| 9100 | YEAR | EA | | | |
| | INVY | 1.00 | | | |
| | SL | 150.00 | | | |

TOTAL INVENTORY= 1.00 DES. EQUIV. SL.= 150.00 AWQD= 150.00
PLN. EQUIV. SL.= 125.00 AWQP= 125.00

Activity: 6290 GEN SNOW/ICE CONTROL
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:N A C T I V I T Y S U M M A R Y

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 1.00 EA | | | | |
| Daily Prod: | 30.00 PER HRS | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 150.00 | 150.00 |
| Cost/Crew Day: | $ 567 | Annual Work Quantity: | | 150.00 | 150.00 |
| Cost/Unit of Work: | $ 19 | Total Cost: | $ | 2,837 | $ 2,837 |
| Standard Crew Size: | 3.0 | Labor: | $ | 1,707 | $ 1,707 |
| Deviation Level: | 20 % | Equipment: | $ | 780 | $ 780 |
| | | Material: | $ | 350 | $ 350 |
| | | Total Crew Days: | | 5.0 | 5.0 |
| | | Total Person Days: | | 15.0 | 15.0 |
| | | Cost/Unit of Inv: | $ | 2837 | $ 2837 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | .0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | .0 | .0 | .0 | .0 | .0 | 5.0 |

P.G. Expn:N L A B O R, E Q U I P M E N T & M A T E R I A L

| LABOR ( 34/HR) | | EQUIPMENT ( 16/HR) | | MATERIAL ( 70/DAY) | |
|---|---|---|---|---|---|
| 1120 ENG EQUIP OP | 1.0 | 3220 ROAD GRADER | 1.0 | 5430 SAND | 10.0 |
| 1130 MOT VEH OP | 1.0 | 3040 DUMP TRUCKS-5YD | 1.0 | | |
| 1160 LABORER | 1.0 | | | | |

S.L. Expn:N F E A T U R E I N V E N T O R Y D E T A I L

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 9100 | YEAR | EA | | | |
| | INVY | 1.00 | | | |
| | SL | 150.00 | | | |

TOTAL INVENTORY= 1.00 DES. EQUIV. SL.= 150.00 AWQD= 150.00
PLN. EQUIV. SL.= 150.00 AWQP= 150.00

Activity: 7110 HAUL TRASH/GARBAGE
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y ACTIVITY SUMMARY

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 2.00 EA | | | | |
| Daily Prod: | 3.00 TRUCK LD | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 200.00 | 150.00 |
| Cost/Crew Day: | $ 269 | Annual Work Quantity: | | 400.00 | 300.00 |
| Cost/Unit of Work: | $ 90 | Total Cost: | $ | 35,804 | $ 26,860 |
| Standard Crew Size: | 1.0 | Labor: | $ | 19,808 | $ 14,860 |
| Deviation Level: | 20 % | Equipment: | $ | 15,996 | $ 12,000 |
| | | Material: | $ | 0 | $ 0 |
| | | Total Crew Days: | | 133.3 | 100.0 |
| | | Total Person Days: | | 133.3 | 100.0 |
| | | Cost/Unit of Inv: | $ | 17902 | $ 13430 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8.3 | 8.3 | 8.3 | 8.5 | 8.5 | 8.5 | 8.4 | 8.3 | 8.3 | 8.2 | 8.2 | 8.2 | 100.0 |

P.G. Expn:Y LABOR, EQUIPMENT & MATERIAL

| LABOR ( 15/HR) | | EQUIPMENT ( 12/HR) | | MATERIAL ( 0/DAY) |
|---|---|---|---|---|
| 1120 ENG EQUIP OP | 1.0 | 3061 GARBAGE TRUCK | 1.0 | |

S.L. Expn:Y FEATURE INVENTORY DETAIL

| CODE | NAME | TOTAL | 1 | 2 | 3 |
|---|---|---|---|---|---|
| 7110 | GARBAGE TRUCK | EA | | | |
| | INVY | 2.00 | | | |
| | SL | 200.00 | | | |

TOTAL INVENTORY= 2.00 DES. EQUIV. SL.= 200.00 AWOD= 400.00
PLN. EQUIV. SL.= 150.00 AWOP= 300.00

Activity: 7120 MAINTAIN LANDFILL
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 40.00 ACRE | | | | |
| Daily Prod: | 10.00 PER HRS | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 6.00 | 6.00 |
| Cost/Crew Day: | $ 477 | Annual Work Quantity: | | 240.00 | 240.00 |
| Cost/Unit of Work: | $ 48 | Total Cost: | $ | 11,443 | $ 11,443 |
| Standard Crew Size: | 1.0 | Labor: | $ | 3,566 | $ 3,566 |
| Deviation Level: | 20 % | Equipment: | $ | 7,877 | $ 7,877 |
| | | Material: | $ | 0 | $ 0 |
| | | Total Crew Days: | | 24.0 | 24.0 |
| | | Total Person Days: | | 24.0 | 24.0 |
| | | Cost/Unit of Inv: | $ | 286 | $ 286 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.0 | 2.0 | 2.0 | 2.1 | 2.1 | 2.1 | 2.1 | 2.0 | 1.9 | 1.9 | 1.9 | 1.9 | 24.0 |

P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 15/HR) | | EQUIPMENT ( 33/HR) | | MATERIAL ( 0/DAY) |
|---|---|---|---|---|
| 1120 ENG EQUIP OP | 1.0 | 3420 BULLDOZER | .5 | |
| | | 3410 SCRAPER | .5 | |

S.L. Expn:Y **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 7120 | LANDFILL | ACRE | | | |
| | INVY | 40.00 | | | |
| | SL | 6.00 | | | |

| | | | | | |
|---|---|---|---|---|---|
| TOTAL INVENTORY= | 40.00 | DES. EQUIV. SL.= | 6.00 | AWQD= | 240.00 |
| | | PLN. EQUIV. SL.= | 6.00 | AWQP= | 240.00 |

Activity: 9100 SUPERVISION
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y A C T I V I T Y S U M M A R Y

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 1.00 EA | | | | |
| Daily Prod: | 10.00 PER HR | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 1,500.00 | 1,500.00 |
| Cost/Crew Day: | $ 165 | Annual Work Quantity: | | 1,500.00 | 1,500.00 |
| Cost/Unit of Work: | $ 17 | Total Cost: | $ | 24,780 | $ 24,780 |
| Standard Crew Size: | 1.0 | Labor: | $ | 22,530 | $ 22,530 |
| Deviation Level: | 20 % | Equipment: | $ | 2,250 | $ 2,250 |
| | | Material: | $ | 0 | $ 0 |
| | | Total Crew Days: | | 150.0 | 150.0 |
| | | Total Person Days: | | 150.0 | 150.0 |
| | | Cost/Unit of Inv: | $ | 24780 | $ 24780 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12.5 | 12.5 | 12.5 | 12.6 | 12.7 | 12.6 | 12.6 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 150.0 |

P.G. Expn:Y L A B O R, E Q U I P M E N T & M A T E R I A L

| LABOR ( 15/HR) | | EQUIPMENT ( 2/HR) | | MATERIAL ( 0/DAY) | |
|---|---|---|---|---|---|
| 1110 MNT GEN FRMN-EW | 1.0 | 3010 PICKUP-2WD | 1.0 | | |

S.L. Expn:Y F E A T U R E I N V E N T O R Y D E T A I L

| CODE | NAME | TOTAL | 1 | 2 | 3 |
|---|---|---|---|---|---|
| 9100 | YEAR | EA | | | |
| | INVY | 1.00 | | | |
| | SL | 1500.00 | | | |

TOTAL INVENTORY= 1.00 DES. EQUIV. SL.= 1,500.00 AWQD= 1,500.00
PLN. EQUIV. SL.= 1,500.00 AWQP= 1,500.00

Activity: 9200 ADMIN/LV/TRNG
Management Unit: ROAD ROADS & GROUNDS BRANCH

P.G. Expn:Y **A C T I V I T Y S U M M A R Y**

| | | | | Desired | Planned |
|---|---|---|---|---|---|
| Feature Inv: | 1.00 EA | | | | |
| Daily Prod: | 120.00 PER HR | | | | |
| Hours/Act Day: | 10.0 | Service Level: | | 4,000.00 | 4,000.00 |
| Cost/Crew Day: | $ 1369 | Annual Work Quantity: | | 4,000.00 | 4,000.00 |
| Cost/Unit of Work: | $ 11 | Total Cost: | $ | 45,571 | $ 45,571 |
| Standard Crew Size: | 12.0 | Labor: | $ | 45,571 | $ 45,571 |
| Deviation Level: | 20 % | Equipment: | $ | 0 | $ 0 |
| | | Material: | $ | 0 | $ 0 |
| | | Total Crew Days: | | 33.3 | 33.3 |
| | | Total Person Days: | | 399.6 | 399.6 |
| | | Cost/Unit of Inv: | $ | 45571 | $ 45571 |

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | CD Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.8 | 2.8 | 2.8 | 2.9 | 2.8 | 2.8 | 2.8 | 2.8 | 2.7 | 2.7 | 2.7 | 2.7 | 33.3 |

P.G. Expn:Y **L A B O R, E Q U I P M E N T & M A T E R I A L**

| LABOR ( 137/HR) | | EQUIPMENT ( 0/HR) | MATERIAL ( 0/DAY) |
|---|---|---|---|
| 1120 ENG EQUIP OP | 3.0 | | |
| 1130 MOT VEH OP | 3.0 | | |
| 1110 MNT GEN FRMN-EW | 1.0 | | |
| *1160 LABORER* | *3.0* | | |
| 1170 RR MNT OP | 2.0 | | |

S.L. Expn:N **F E A T U R E I N V E N T O R Y D E T A I L**

| CODE | NAME | TOTAL | ——1—— | ——2—— | ——3—— |
|---|---|---|---|---|---|
| 9100 | YEAR | EA | | | |
| | INVY | 1.00 | | | |
| | SL | 4000.00 | | | |

TOTAL INVENTORY= 1.00 DES. EQUIV. SL.= 4,000.00 AWQD= 4,000.00
PLN. EQUIV. SL.= 4,000.00 AWQP= 4,000.00